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RESEARCH BY THE U. S. FOREST SERVICE

In the large view, the real level of achievement of the U.S. Forest Service system of regional forest and range experiment stations must be appraised by the:

1. fit of station organization and of research projects to the realities and urgencies of wildland and resource problems;
2. imagination, coupled with discipline, used in project organization and method;
3. intelligent meshing of station work with that of other research organizations;
4. productivity of individual researchers and of staffs;
5. effort and skill used in putting research results promptly in terms and forms acceptable and clear to potential users;
6. self-control exercised in closing down projects or in refraining from costly and pointless dalliance in fascinating but futile minutiae;
7. vigor of reporting results which challenge sacred shibboleths of practice and habit;
8. clarity with which complex interrelations of all values of wildlands are recognized, which is perhaps most important, and by the firmness with which directors prevent the isolation of lines of work and projects and, instead, bring about pooling of diverse skills and preoccupations on problems of interrelations.

The annual reports of the several stations, though dealing primarily with the immediate past and the immediate future, carry a reasonably clear picture of the value of each station's work.

The original concept of station organization as devised by the founder of the system, Earl H. Clapp, included full territorial responsibilities; top direction by an assistant chief of the Forest Service; freedom from control by other general administrators; development of a staff of the kinds of experts, organized in divisions, appropriate to each region's major problems; development of field facilities for continuing work through the experimental forests and ranges; working out relations and division of work with other agencies.

This concept, as followed and applied, has worked well. It has shown desirable and justifiable flexibility, for example, in assigning a single line of research — watershed, fire, range, or timber — to a research center in California, and in the southern states assigning all lines of work to each subregional center.

At the same time, the assignment of work to stations has been stretched into the survey and program–planning field by perpetuation of their responsibilities for two major nation-wide projects — the forest survey and the upstream flood prevention surveys and plans. Much initial research into method was required, and the stimulus of the assignments has clearly found effect in continuing and productive efforts to refine methods and improve results. Continued handling of the forest survey stations has the further justification in that the principal aim of the work is to appraise the nation's forest resources through interpretation of statistics on forest areas and ownership, timber volumes, rates of growth and drain, and current and prospective requirements for different forest products. Such work is conducted in close interdependence with other economic research. On the other side, handling of now reasonably routine flood prevention surveys and the formulation of remedial programs can hardly fail to reduce the output of research by supervising research officers. Team handling by researcher and administrator, each in his natural field, might be advantageous.

Clearly, the stations have a lively understanding of major problems in the several regions, and have responded by allocation of resources and relative attention to the broad lines of work. The inter-mountain, southwestern and Rocky Mountain stations emphasize range and range watershed management; the eastern U.S. stations, the problems of rebuilding deteriorated forest, and utilization of low-grade forest products; the Pacific Northwest station, the conversion of great virgin forests into productive managed forests; the California station, the problems of brush-covered critical watersheds, of protecting forests against fire, and of developing superior hybrids and races of pines; the Northern Rockies station, the problems of western white pine management, including silvicultural control of blister rust, and of fire control in all areas. Nearly all stations emphasize forest economics and many provide a service designed to expand forest utilization. Though range research has been traditionally an activity of the western stations, the central states and southern and southeastern stations are now involved in problems of woodlot and pine forest grazing, and the eastern stations are moving into forest influences and watershed management.

In this way, each program undertakes to give attention to regional problems below the rank of the headliners, yet appropriations and programs have not yet caught up with some of the new and insistent regional problems; for example, fire control in the southwest and watershed management in the vast inter-regional Columbia river. But some lag is to be expected.

Methods of planning and organizing projects are professionally disciplined and sound, as there is growing acceptance as appropriate of the mathematical theories of sampling, of experimental design, and of testing results. The evident virtues of mathematical criteria may, on the other hand, be accepted to the degree that statistical respectability is too exclusively the *sine qua non* of study design. For example, the Northern Rockies station has lately analyzed the vast accumulated and hitherto unsifted fire records and derived important relations and trends from them, i.e., non-statistical truths. Older and less precise methods have often produced worthy and enduring results when applied by superior minds.

The system encourages ingenuity and daring in method, and there is alertness in applying new technologies to problems of forestry; for example, in control of pests and undesirable vegetation by the vast array of chemicals and machines now available. There is, of course, a premium on both lower unit costs and on speed in covering great areas. Broadly, eastern stations emphasize rebuilding

(Continued on inside back cover)

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Cover Photograph: *Korea. – Protected trees around a temple. The predominant species of the natural indigenous forest is* Pinus densiflora, *often mutilated by constant cutting and lopping. Some good young crops have become established near the battle areas where no cultivators have been for some time. Wherever protection is given, as in temple forests, the proportion of broad-leaved trees increases at once. Sir Herbert Howard (United Kingdom) was the forestry member of a mission sent earlier this year to Korea by FAO and the United Nations Korea Reconstruction Agency to prepare a five-year agriculture, forestry and fisheries rehabilitation program.* (Photograph by Breitenbach, UNKRA).

FOURTH WORLD FORESTRY CONGRESS

INDIA has accepted the honor and responsibility of organizing a Fourth World Forestry Congress. The Congress will open at New Delhi on 4 December 1954 and meetings will continue at Dehra Dun, location of the national Forest Research Institute and Colleges, from 6 to 17 December.

Previous Congresses have been held in Italy, Hungary and Finland so that next December will be the first occasion on which this aptly-named world parliament of foresters and technicians will have met outside Europe. As befits the locale of the host country, strong emphasis will be given to tropical silviculture, but by no means to the exclusion of other topics.

The function of this Congress, sponsored by FAO, will be to widen the horizon of foresters and technicians from many lands and to focus knowledge derived from technical, social and economic research around a general subject of particular importance to the future of forestry and the utilization of the products of the forest. This general subject, setting the theme for the Congress, will be the role and place of forested areas in the general land economy and economic development of a country.

The Organizing Committee set up by the Government of India has decided in consultation with FAO that the Congress shall first examine "the present status of forest protection and forest management in the world." Thereafter it will split up into four sections to give attention to separate aspects of the central theme. The sections, which doubtless will resolve themselves into smaller groupings, will be concerned with the following broad subject headings:

1. Protective functions of the forest.
2. Productive functions of the forest.
3. Forest products utilization.
4. Tropical forestry.

Under each subject-heading attention will be concentrated on a limited number of selected topics, and these are being set out in a pamphlet about the Congress which the Government of India will shortly be distributing. This pamphlet will also explain how the Congress and the preceding field trips are to be organized and give details regarding membership, procedure for submitting discussion papers and general rules for conducting the proceedings.

The Congress will offer an opportunity for technical discussion and the exchange of ideas and experience. As a result it should help countries to design and co-ordinate their several forest policies, and therefore it is to be hoped that the sum total of sound advice emanating from the participating experts, expressing their free and personal opinions, will be impressive.

All countries are asked to give the fullest support to the Government of India and so help to ensure success for this Fourth World Forestry Congress.

Above. *Results of control measures undertaken by the Service de la Défense et de la Restauration des Sols, Algeria, on badly eroded slopes of the Blida Atlas Mountains are seen in this picture. Banquettes (terraces) with a gradient of not more than half of one percent were constructed five years ago across steep gullied slopes. Fruit trees have been planted on the banquette fill. Cultivation (lower right) is permitted between banquettes, once gullying is controlled. On the very steep slopes, the native grass forage growing between banquettes is cut by hand.*

Below. *Erosion control efforts near Seoul, Korea. Alder,* Pinus densiflora *and* P. rigida *are becoming established on terraces.*

Soil Conservation

A Plea for International Action

by Saleh-ud-Din Ahmad,

Deputy Conservator of Forests, Punjab, Pakistan.

Man must attempt to control his physical environment. Above all he must control the accelerated erosion caused by his own misguided activities and stamp out abuse of humanity's basic source of wealth — the natural soil cover.

It may well seem strange that the idea of conserving natural resources, and particularly the soil, is not innate in man. Some claim indeed that it is in those who live in constant contact with the soil from which they derive their sustenance. They point to primitive communities living off shifting cultivation who are careful not to deplete the fertility of the soil, and remind us that the terrace which in its various adaptations, is the basis of the modern system of soil conservation, was used by the earliest men to preserve the soil. But on the other hand most nomadic pastoral tribes have no intelligent comprehension that the insidious deterioration of soils is due to overgrazing by their herds.

It is easy to understand man's prodigal use of natural resources so long as he lived in widely dispersed communities and could not substantially affect the vegetation and, through it, climate, soil and water supply. It is more difficult to grasp why, with the evolution of civilization, he should have failed to appreciate the results of continuous treatment of this sort and permitted negligence towards natural resources whose disastrous effects have become increasingly numerous, complex and potent.

Ignorance and apathy remain universal reasons for the neglect of conservation. In heavily populated areas they are bolstered by the stress of deriving daily sustenance from the land, a struggle that thrusts any longer-term considerations into the background. In thinly populated areas, it is often plain greed that leads to the destruction of forests or to overgrazing. Such simplified reasoning, however, leaves out of account complicated secondary factors such as defective agrarian structure, lack of balance between farm and industrial populations, ill-defined privileges or rights of usage, and so forth.

The success of some societies that have apparently managed to use the soil for immediate purposes and yet keep it usable indefinitely, may in the main have been due to favorable natural conditions — temperate climate; adequate but not excessive annual rainfall, fairly evenly distributed; gentle relief and suitable soil texture — all of which have combined to produce a balance between the soil, the vegetation protecting it and other natural factors. Misuse has been corrected by an easy return to this state of balance, of which the climax vegetation is the fulfilment, or at least to a state ensuring reasonable soil conservation and maintenance of soil fertility. Other societies have not been so fortunate, because the balance once upset has not been easily recovered and accumulative misuse has inevitably ended in the degradation of the soil.

Our present civilization provides man with so much more powerful means than in the past of affecting mankind itself and the natural environment — so powerful, in fact, as to make it possible to remodel nature — that it can either hasten soil degradation beyond all previous measure or end it.

Growing populations augmenting land hunger in already overpeopled regions, the spread of forest industries, the very trend toward the industrialization of farming, the opening of roads and access to forests and natural grazing lands are all temptations to still more misuse of the natural soil-protective vegetation.

Yet, at the same time, our civilization provides the means and opportunities to devise more effective conservation methods, to spread knowledge about them more widely and even to make their use compulsory. It gives to users of the soil cheap means of applying such methods. It permits easy co-ordination of effort at the national level and makes international collaboration easier to establish — though it is not always simple to take advantage of this.

The question is whether all this is sufficient to offset the increasing causes of erosion. So far, it looks as if the answer may quite well be negative. In that case, we must ask ourselves what means can best be employed to safeguard the common heritage of mankind, the soil, and whether concerted international action is required.

Features of the Soil Conservation Problem

There is still some confusion in the public mind over what is meant by "conservation", which may in part be due to the fact that many national and international bodies have been created — often comprising scientists, artists and ardent nature lovers — whose avowed object is conservation of natural resources in the strictest sense, irrespective of any economic value the resources may have. The power for good of such groups cannot be denied, and it must be admitted that, for many reasons — scientific, aesthetic or perhaps recreational — it is desirable that some natural environments be kept as little changed as possible, and others left quite undisturbed so as to give a chance of survival to plant or animal species in danger of becoming extinct. This concept of conservation, however, is in the main quite different from that which concerns us here. We mean

by "conservation of natural resources" sound management aimed at turning resources to the best possible account. It is merely another way of expressing what foresters call "sustained-yield management."

The problem

The soil conservation problem must be approached as a whole and not piecemeal. True, soil conservation in sum depends on the good management of each separate parcel of land, but the complete aim can only be fulfilled if sound land use is effectively applied to a whole area.

Examples are not lacking of how farmlands in low-lying valleys, towns on riverbanks, or estuary ports are dependent upon the way forests and pastures on the watersheds above are treated; the death of the ancient port of Ostia on the Tiber near FAO headquarters is a good case in point. More spectacular evidence of the effects of the lack of good land use practices is afforded by the large plains or plateaus particularly liable to wind erosion which have come to be called dust-bowls. Any one fraction of an area of this sort may be remarkably well cultivated and every precaution taken to ensure renewal of the soil fertility. Yet nothing will prevent its ultimate destruction if the rest of the area is overgrazed, if protection against wind is not provided by suitable windbreaks, if farming carelessly exposes an easily erodable soil, if shifting dunes have not been fixed by grasses or trees and if, lastly, the whole of the plain or plateau is not used according to well-conceived purposes, with proper techniques prescribed for each separate part so as to assure the stability of the whole.

The interdependence of the various forms of land use is not only a matter of physical relationships — there are also economic and social facets. One does not expect to find prosperous fertile farms in a valley bottom with degraded forest and grazing land above. Those who have lived off this forest and grazing land inevitably drift to the more low-lying lands and, accustomed to other ways of living and to other methods of using the soil, in turn bring about deterioration here of once rich arable soils and perhaps even cause social tensions such as arise between cultivators and herdsmen in many parts of the world where these two kinds of land users compete against each other.

The decline of ancient nations in the eastern and southern Mediterranean countries is often cited as an example of the consequences of improper land use, the destruction of forests and neglect of the principles of conservation. Certainly wars and invasions do not wholly explain the decline in this region. Toynbee [1] says that a society always dies from suicide or murder — and nearly always from the former. It would be surprising if peoples who had taught the world irrigation and intensive farming in Spain, had deliberately allowed terraces, canals and agricultural lands to go to ruin elsewhere. Perhaps they had not looked for an *integrated* approach to soil conservation. Soil conservation was good on agricultural lands, but was bad on forests and grazing lands. So the whole system collapsed.

[1] Arnold J. Toynbee. *A Study of History*. Oxford University Press.

Effect of industrialization

In modern times, the inter-relationship between man and his physical environment is still further complicated by industrialization. Undoubtedly some countries are more particularly suited to farming and agriculture, and others to industry. In any given country, however, there is a certain optimum balance between the numbers of people engaged in agricultural pursuits and in industry. The balance is not, of course, immutable and the difficulties inherent in attaining an equilibrium are still being experienced even by many so-called advanced countries, while in the underdeveloped countries the balance is very far from having been reached.

Industrialization must be accompanied by a sound practical approach to land use. For example, industrial expansion needs a constant supply of water not only as a raw material or a source of energy but also for consumption by the communities it necessarily creates.[2] This water comes from the soil and a constant supply needs soil management and sound methods of conservation. Again, industrial expansion necessarily depends on raw materials of mineral, plant or animal origin. If the minerals are lacking, primary industry can only be based on the proceeds of fishing or agriculture, tree crops or forests, and the last three will require sound soil use.

Land under agriculture and forests

A feature to be stressed is one which is too often ignored, namely, the difference in treatment accorded to the two broad land use categories — agriculture and forestry.

Agricultural uses [3] of the soil may be defined broadly as the harvesting, annually or at regular intervals, of a crop introduced by man, following tillage of the soil and sustained and regular cultivation and care; while what we will call forest and/or range uses involve the harvesting of natural vegetation, the manner of harvesting (whether it be the cutting of wood or grazing by cattle or wild animals) being, as a general rule, man's only means of modifying, for better or worse, the quantity and quality of future harvests.

On this basis, it may be said that, compared with agricultural land, forest and/or range land extends over an extremely large part of the globe. It is difficult

[2] A recent news note in *Unasylva* says that the city of New York alone must provide an average of 800 million gallons (3,000 million liters) of fresh water a day for domestic consumption.

[3] Agricultural uses obviously include using natural crops grown on the soil for intensive stock-raising or intensive production of dairy products. This emphasis on intensive use tempts one to describe agriculture as intensive land use as contrasted with extensive use for forests or range, but this cannot be generally acceptable since there is already in common parlance an extensive agriculture where low yields per unit area are expected and an intensive silviculture which aims at a high timber output per unit of area.

However we define them, these two land use classes are sufficiently distinct for practical purposes, even though some agricultural uses are combined, in time and space, with a forestry utilization. Perhaps natural fallow, so common in the cycle of farming operations, can be considered as a forest and/or range utilization, though it cannot always be exactly stated into which classification the vast stretches of land used for shifting cultivation should fall.

to give any exact figure because of inadequate statistics or because of overlapping of the two classes, but it would seem that roughly 60 percent of the world land area serves for forest and/or range use.

Can it be said that this area is on an equal footing with agricultural land in regard to the soil protection afforded? Is there an even chance that a piece of land under forest and/or range use will be given as careful attention as a piece of farm land? The answer is obviously a negative one and the reasons are many.

It may be claimed that forest and/or range lands are generally difficult of access so that, as long as man interferes only very occasionally, nature can take care of soil conservation. Yet it should be noted that the balance due to this relative inaccessibility is precarious and can be upset by apparently trivial causes — witness the results of introducing the rabbit into Australia or deer into New Zealand.

It is obviously much easier to arouse interest in soil conservation in the farmer, who obtains his living direct from a limited area of soil, than a herder whose range of operations is seldom strictly limited and whose direct interest lies in the cattle he raises and not in the vegetation which provides the forage; or than a logger who is sometimes only concerned with using a forest to keep supplies going to a sawmill long enough to amortize the investment.

Again, considerable expanses of forest and/or range lands are often public property, frequently subject to rights of use that are only vaguely defined, and the user has no strong incentive to concern himself with soil conservation.

Forest and/or range lands are therefore most susceptible to misuse, and this may not consist solely in careless utilization and intolerance of controls. It may also mean the conversion of land which is most suited for forest and grazing into cultivated land.

This latter process is only natural. There are only two ways of increasing food production from the world's lands to meet growing needs. One is to increase the yield from existing cultivated land; the other is to extend the area of cultivated land by encroaching on forest and/or range land. Neither has *a priori* advantage over the other. True, extending the cultivated area is sometimes impossible because of the poor quality of the soil or the obvious dangers to which it would be exposed if the protective plant cover were removed. But there are methods by which land that has served so far solely for forest and range can be brought satisfactorily under permanent cultivation, with due regard to proper soil conservation. One cannot be dogmatic and say that a steep slope can never be successfully cultivated, since it is always physically possible to lay out terraces by which the slope can in fact be put to crops and yet soil conservation be ensured.

It is true, however, that terracing or any improvement works that would make it possible to cultivate land previously used for forest and range, frequently require investments or recurring expenditures quite disproportionate to the agricultural gains that can be expected. In other words, under present conditions, conversion into cultivated land is uneconomical. However, examples of such attempts are not wanting and their abandonment after failure is not the least important of the many causes of soil degradation on forest and/or range lands.

There are other physical and economic factors to be taken into account in planning land utilization. But it is not our intention — nor a forester's responsibility — to investigate here the complex rules which should govern such planning.

Enough seems to have been said to show that soil conservation on forest and/or range land, although just as important (because of the interdependence of soils) as on agricultural lands, is usually much more neglected and much more difficult to achieve. This is all the more to be deplored when it is considered that possibly a large part of the former constitutes a potential reserve for the extension of agriculture. If ever an expansion of cultivation becomes economically feasible, it will be sad to find the reserve badly depleted and only unnecessarily degraded land left for farming.

The Problem and International Action

Soil conservation is a factor in the prosperity of each country. Any problem affecting that prosperity and any proved solution that helps to raise the standard of living of the population, is of concern also to that country's neighbors and even to distant countries.

Soil conservation is also the problem at the root of many other problems, agricultural, industrial and social, whose solution is universally desired.

There is another point: it is an *intergovernmental* problem because it is essentially a *governmental* problem. It is not a case of modernizing a sector of a national economy that private initiative — if the sector were under private control — could achieve equally well, but rather one of an over-all *policy* for the conservation — that is, good management — of a country's soils and obviously the government must be ultimately responsible for such a policy.

Doubtless, if action were called for only in regard to cultivated lands, which are usually privately owned, it might be hoped that the owner's self-interest would suffice to ensure soil conservation. A governmental soil conservation *policy* might not in fact be necessary at all but only local measures to help the farmers, technically or financially, to rectify certain features of, for instance, the agrarian structure. There would be no need for long-term objectives, concerted plans or the research which forms the core of governmental policy.

But action is essentially called for in regard to lands under extensive utilization. As has already been said, large areas of such lands are the direct responsibility of governments, but, even where they are in private ownership, the owner usually has not the same incentive to concern himself with soil conservation as in the case of cultivated lands, and frequently he also does not have the means to do so. His personal interests may even run counter to soil conservation.

Finally, there are also the large domains split between agricultural and forest and/or range use, which also need a government policy because the problems they raise are integral to the general economic development of each country.

Thus, no government is in a position to evade the obligation to work out a soil conservation policy, of which propaganda work and education are an essential

part. Subsidies, loans and the like may be required for the implementation of policy, but they cannot actually replace policy.

The need has been recognized in some countries which, relatively recently, have created soil conservation services whose work has proved efficient and already been crowned with success. Even here, however, the question may perhaps be asked whether the services are working to implement a basic policy relating to soil conservation, or whether rather they are operating in furtherance of other policies to which land use is only incidental; whether they have not been established more to remedy local situations (assuredly a worthwhile undertaking) than to apply a truly national soil conservation policy.

At all events, there is a clear need for such national policies and their international importance; and, because of this, there seems to be all the more necessity to co-ordinate such policies on the international plane.

Lands under extensive utilization frequently extend, in one distinct geographical unit, well beyond the political frontiers of States. The watersheds of many of the large rivers of the world are international. Obviously, on the kind of treatment and care given to the soils on these watersheds and in the upper valleys of the rivers will depend their flow, spates, the silt or soil material they carry in suspension, and the possibilities for navigation and use for irrigation or power production, all of which are of vital importance for countries astride downstream portions of the rivers. A typical case is western Pakistan, which is regularly threatened by flooding of rivers that have their catchment basins in India and Kashmir. Likewise, many large plains or plateaus straddle political frontiers which are fortunately or unfortunately ignored by the winds that sweep over them.

Nomadic herds, too, know no frontiers. The destruction of soils through misuse by wandering herders in one country is almost infallibly paralleled across the border. Pakistan again offers an example; its frontier with Afghanistan is crossed every winter by migrating herds of camels and flocks of hungry sheep and goats in search of better forage.

Fire also does not stop at frontiers and can raise serious problems, as on the Argentine-Chilean border or between Canada and the United States. Lastly, insect plagues or diseases are often partially affected by the way the soil and its vegetation are treated. Soil divested of vegetation and cleared spots in forests, for example, provide the migratory locust with favorable ovipositing conditions.

It should also be recognized that the development of vast forest areas, such as the Amazon basin, that are still practically intact, is an international matter not merely because such lands extend over the frontiers of several countries nor because their development may require the investment of international capital, but because they may well represent the world's largest land reserves still available for expansion of food production. Settlement of these practically virgin lands should not be attempted without some internationally approved plan to ensure conservation of the soil and sustained production. The task — though gigantic — is not essentially difficult, since it is theoretically possible to create from the beginning the economic and social conditions which are compatible with the soundest management of the land, taking into account all the characteristics of the environment and climate.

If the soil conservation problem is international, it stands to reason that FAO should, as an Organization, apply itself to finding solutions, and the efforts expended should be commensurate with the fact that this is the problem at the core of most of the Organization's other problems.

Contribution of FAO

The importance of the soil conservation problem has certainly not been ignored by FAO. But it must be remembered that FAO's activities are guided by the wishes of the member nations and their attention is perhaps more easily held by narrower, immediate problems, whose solution may give spectacular results.

FAO has made wide use already of the three basic methods at its disposal: dissemination of information, direct technical assistance, and the co-ordination of national activities on the international plane. It may be said that, in a way, soil conservation is implicit in practically all FAO projects and that, indirectly or in effect, any improvement in agricultural or silvicultural techniques promotes such conservation.

Let us review briefly the main action taken by FAO. There have been publications such as *Soil Conservation*, which was one of the first studies brought out by the Organization, or *Land Classification for Agricultural Development* only recently released. Under the Technical Assistance Program many experts have been working in different countries on land use classification, improving soil productive capacity, or on rehabilitation of deteriorated soils. Technical assistance has brought out clearly the central position of the soil utilization problem, and in many cases, especially where it is a matter of advising or applying forest or range use policies adapted to local conditions, has revealed that no results can be expected until this central problem has been solved. Lastly, in regard to international co-operation, there are a European Working Party on Land and Water Utilization and Conservation; regional Forestry Commissions and the subsidiary bodies which have concerned themselves with the question, though obviously from a particular point of view; and a meeting on land utilization problems in Southeast Asia which was held in Ceylon in 1951.

What has still to be done is perhaps not so much to intensify technical action already under way as to bring action up to a political level. An objective might be to have all governments make formal acceptance of a rational land use policy as a basis for their economic development, founded on the conservation techniques that modern research and long experience have developed and are constantly improving. The goal would be the co-ordination of governmental policies, present or future, through FAO.

Despite the apparent diversity, perhaps all national soil conservation policies might be based on broad, common principles. If so, a formal declaration of such principles might be a first step toward more effective international action.

A pattern for such a declaration is provided by the "Principles of Forest Policy" adopted by the FAO

Conference in 1951.[4] It may be objected that this forestry statement is couched in very general terms, so much so that some who read it — perhaps a little too cursorily — feel that these principles state only the obvious and that a similar sort of declaration on soil conservation would be ineffective. Such criticism is not justified in the view of those who heard the animated discussions on the wording of each phrase — and almost on every word — of the statement, and who can vouch that each of the underlying ideas has far-reaching implications. A similar statement on soil conservation, finely phrased, would have the merit of showing the world that a generally accepted policy of soil conservation was at the basis of all FAO's activities.

If any such principles can be stated, they can clearly only be determined and drafted by persons with wide experience of the many differing regions of the world and accustomed to consider land use problems not only in their physical but also in their economic and social aspects. Only FAO could suitably call such persons together.

Principles of a Soil Conservation Policy

Possibly a first principle should recognize that there are limits to the diversion of any piece of land from what we may call its natural destination to other uses, which must not be exceeded if it is desired to avoid impairing soil fertility. The limits depend on the characteristics of each fragment of land and their relation to the prevailing topography and climate, but they also depend on technical advances in conservation methods and on economic conditions which, at any given moment, make it possible or impossible to apply such methods.

Such a principle, if accepted, would assume that a soil conservation policy required constant adjustment to allow for technical and economic progress in each particular country. Also, it would entail a system of land classification that would have to allow for development in those same technical and economic factors.

A second principle might emphasize the over-all nature of the soil conservation problem, which demands the establishment and maintainance of a certain balance between the various forms of land use that the first principle has made appear possible. Such a balance should be obtained first for the two broad land-use classes — agricultural land, and forest and/or range land — which we have already distinguished. This classification would not be enough and certainly many more varied subdivisions would have to be differentiated in each class. The balance to be established must have a physical purpose — soil conservation and, a very important corollary, regulation or improvement of the water supply; and an economic purpose — optimum production in relation to local, national, regional or world levels. This second principle makes the soil conservation policy dynamic and not static.

To ensure conservation of the soil on any piece of land, obviously it is not enough to determine the use to which it should be put. Over-use or, indeed, any use under certain conditions may cause the soil to deteriorate. A third principle, therefore, should be to adopt norms for ensuring soil conservation and maintenance of fertility for each specific use. Such norms would be, for example, the limit on crops which deplete cultivated soils, the optimum rate of stocking of rangeland, a minimum rotation for coppice-managed forest. Clearly, no such declaration of principles could go into all details, but it could at least recognize the need for such norms.

The application of a soil conservation policy may entail restrictions upon traditional methods of using the land and changes in acquired habits, perhaps even in some cases the dislocation or resettlement of the population. Success can only be ensured if the policy is understood and approved by the whole population. This implies — as could be stated as still another principle — that the idea of conservation must be instilled in the mind of the people throughout the country. Perhaps it is not so much a question of propaganda as of a fundamental education for all, and more particularly, for children from their earliest years. Much is being done in this respect in some countries and it is to be hoped that all could follow suit. Citizens, townsmen as well as countrymen, need to learn about conservation just as much as to learn elementary arithmetic, and to accept it as a natural habit of mind.

Outlook for the Future

The soil conservation problem is far from being a recent discovery. Not long ago, an American magazine cited a passage from Plato which deplored the ruin of Attic forests and pastures. Farmers, ever since farming became a way of life, and specialists, from the time farming became a science, have endeavored to conserve the fertility of their soils and to find the most economical methods for attaining it.

All soil conservation treatises close with one or more chapters on the need for integrated land use, and the essential role of the forest and of rangeland in soil conservation and the regulation of the water supply is clearly stated, if not always fully explained.

How is it then that erosion continues and spreads in this alarming degree?

It may be because, so far, the human aspect of the problem has been neglected. Being a human problem, it cannot be solved by techniques alone; it is necessary to have a policy based on these techniques. We think that this policy is a governmental and intergovernmental responsibility. The existence of international organizations, such as FAO, capable of action not only at the technical but also at the political level, provides governments with the most effective machinery for framing such a policy and promoting its implementation: it is to be hoped that they will make the maximum possible use of this machinery.

[4] Resolution No. 26 of the Sixth Session of the FAO Conference, November-December, 1951.

NOTE: A list of publications selected for reference will be found at the foot of page 160.

Food and Feed Yeast in Germany

Based on a paper presented at the sixth meeting of the FAO Technical Panel on Wood Chemistry, Stockholm, 27-28 July, 1953

by Erwin Schmidt,
Vice-President, Zellstoffabrik Waldhof, Wiesbaden

The medicinal value of yeast has been known since ancient times. But that yeast also constitutes a valuable food for man and animal is a comparatively recent realization, and its introduction as such has only occurred during the last few decades. The wars in Europe encouraged research in this field because, owing to failure of imports from overseas, many countries were faced with a serious protein deficiency. Intensive research work and practical experience revealed that the value of yeast was by no means restricted to its high protein content of 50 percent but that the vitamins and other active factors it contained were at least equally important.

During the first world war, when Germany experienced an acute food and fodder shortage, plans were made for the large-scale production of feeding yeast from molasses with an addition of ammonium salts as a source of nitrogen. But after a while supplies of molasses failed and the newly-built yeast plants had to be shut down. In the 1930's, Professor Fink proposed that instead of molasses, an agricultural product, the sugars contained in sulphite pulp waste liquor or produced by the wood saccharification industry should be used. The latter alternative was expensive and, as regards the former, all the larger pulp mills in Scandinavia and Germany already had alcohol plants, so that major quantities of softwood waste liquor were not available.

Professor Fink found that Torula yeast could be grown on pentose as well as on hexose sugars, which meant that hardwood waste liquors were also suitable as a substrate. There were increasing amounts of beech waste liquor accruing in Germany for which no uses had yet been found.

While wood hydrolysis yields sugar with a pentose content of 20 percent and sulphite waste liquor of softwoods contains 25 percent pentoses, 85 percent of the sugars present in beech waste liquor are pentoses unsuitable for alcohol production but excellent for yeast-growing. On the waste liquor of each short ton of beech pulp produced, 200 to 240 lbs. of yeast can be grown. During the 1939-45 war the annual output of beech pulp amounted to about 340,000 short tons, so that the capacity for yeast could have been roughly 38,000 short tons, apart from any coming from the spentwort from sulphite alcohol plants. Actually, by the end of the war, facilities for the production of 22,500 short tons of fodder yeast a year had been established by the German chemical pulp industry alone, not counting the capacity of the wood saccharification industry which amounted to another 16,500 short tons. Output of these two industries together reached its highest level in 1944, but even then amounted to only 16,500 short tons, due to the fact that some of the plants could not always be run at full capacity because of war damage and air attack.

Present Western German production is considerably smaller, altogether about 10,000 short tons of fodder yeast per year. The two yeast plants of Zellstoffabrik Waldhof account for the larger portion — 55 percent, brewers' yeast about 28 percent, and yeast grown on molasses roughly 17 percent. Roughly half the Waldhof yeast is exported, primarily to European countries — France, Belgium, Denmark and the Netherlands, and also to the United Kingdom.

Production method

The process used by the chemical pulp industry in Germany today is the continuous growing of *Torula utilis* according to the Waldhof process. The same process has been used in the United States for many years. Whereas the baking yeast industry operates discontinuously in a batch operation with addition of both wort and chemicals and uses surface-active oily materials for foam control, the Waldhof process employs no such antifoams. Consequently, a very pure palatable yeast is produced which alone makes it possible to use the product for human consumption. Advantage is taken of the foaming tendency of waste liquor, first, to obtain intimate contact of the liquor plus its yeast content with the air, and secondly, to use as little air as possible and thus render the process more economical. While in batch operations 400 to 1,000 cubic feet of air per pound of yeast are required, the Waldhof method calls for only 150 cubic feet per pound or between one-third and one-sixth.

In the Waldhof method the sulphite waste liquor comes in neutralized and cooled down to 90°F. It flows continuously to the fermenter while at the same time ammonium, potash, magnesium, and phosphate are continuously added. The propagator is designed to disperse air mechanically into the liquid. Simultaneously, it forces vertical circulation of the liquid through the central draft tube. This prevents the accumulation of non-breaking foam on the surface.

An aeration wheel acting as a centrifugal pump sucks in air and effects the conversion of the whole liquid into a uniform air-mixed foam which it keeps in constant circulation.

After a retention time of about three to five hours, depending on whether more hexose or more pentose sugars are added, the original yeast input has doubled itself and the sugars are practically consumed. Through a cock at the bottom of the fermenter the spent liquor

with its high content of yeast is drawn off in quantities equal to the inflow of sugar-containing liquor at the top. A centrifugal device removes the air from the foamy liquor. The yeast is extracted by means of separators, washed several times and subsequently dried in towers or on drums.

Food values of yeast

Yeast has a high nutritive value not only because of its protein content but also because of the simultaneous presence of protein, vitamins and enzymes. The yeast cell, a self-sufficient living entity, produces everything that it needs for maintenance, growth and cell division, namely bios factors, enzymes, ferments and vitamins. By way of contrast, men and animals depend on a supply of many vitamins and active factors from outside because, in spite of their very complex organic structure, they are not themselves capable of synthesizing them. There are ten essential amino acids which must be present in a complete protein. However, foodstuffs contain these essential amino acids in a widely differing proportion and a good diet should therefore be composed of ingredients of both animal and vegetable origin, mixed so that each one of the essential amino acids is present in sufficient quantity.

Table 1. — Amino Acid and Vitamin Content of Five Foods in Comparison with Whole Egg

Contents	Whole egg	Meat	Milk	Yeast	Peas	Wheat
Essential amino acids						
Arginine	100	+ 13	— 33	— 27	+ 39	— 30
Histidine	100	— 10	+ 20	+ 13	— 43	— 5
Isoleucine	100	— 21	— 22	— 7	— 49	— 55
Leucine	100	— 13	+ 23	— 17	— 30	— 26
Lysine	100	+ 6	+ 4	— 14	— 30	— 65
Methionine	100	— 22	— 20	— 71	— 76	— 76
Phenylalanine	100	— 27	— 16	— 36	— 24	— 40
Threonine	100	— 9	— 6	+ 2	— 20	— 39
Tryptophane	100	— 20	+ 7	— 9	— 53	— 9
Valine	100	— 21	— 10	— 9	— 45	— 44
Vitamins						
B_1, thiamine	100	+ 36	— 73	+1540	+ 446	+ 58
B_2, riboflavin	100	+ 3	— 39	+1580	— 21	— 25
Niacin	100	462	— 62	+1720	+ 75	+ 588
B_6, pyrodoxine	100	- 30	— 90	- 60	- 93	- 72
Pantothenic acid	100	46	- 89	+ 36	— 75	— 64
H. biotin	100	— 96	— 97	+ 100	— 97	—100

In Table 1 the essential amino acids in whole egg, taken as 100, are compared with the contents of other foods. Some vitamins are included in the same manner. Whole egg protein is the best — but also the most expensive protein. The Table shows that all proteins, whether of plant or animal origin, differ from whole egg in having either a higher or a lower content of the various amino acids and vitamins. Milk and meat approach nearest to whole egg while peas differ most. As regards protein alone, the biological value of yeast equals that of the best vegetable protein.

Feeding experiments have shown that yeast, due especially to its high lysine and valine content, is an excellent supplement to cereal protein and that it improves considerably the nutritive value of cereal foodstuffs such as bread. For some time efforts have been made in Germany to enrich bread with dried yeast. Experiments carried out at the Mainz University and published in the *Journal of Nutrition* prove that adding 3 percent of a mixture composed of 1.25 dried milk, 1.25 soybean meal and 0.5 yeast leads to a maximum improvement of the biological value of bread. Unfortunately, the enrichment with yeast tends to increase the price of the bread. The added cost must be set against the proved fact that the diet deficiency in Germany after the last war was caused by inferior quality rather than by insufficient quantities of food. Man can stand underfeeding with energy-yielding foodstuffs for some time; but a deficiency of proteins and vitamins will cause serious damages to the inner organs and to the nervous system. It will also weaken the resistance of the human body to tuberculosis and other infectious diseases and lead to a marked decline of mental efficiency.

Feed yeast

As a feeding-stuff, yeast is of particular value for the growth of poultry and cattle. Naturally, the nutritive requirements of young animals differ from those of full-grown beasts. There have been rather fruitless disputes as to whether brewers' yeast or Torula yeast is better suited for growing animals, and comparative tests of different strains of yeast have given different results, as may easily be understood. The amount of vitamins and active factors which yeast may contain differs very greatly, depending on the growing process and the origin of the yeast, so that it is difficult to say what comes from the strain and what comes from the growing process.

The animal organism cannot build up all the protein complexes it requires from yeast protein alone: for the best results, yeast must be employed in a mixture with other animal and plant proteins.

In Germany, the yeast plants have for some time guaranteed the minimum vitamin content of yeast destined for admixture to protein concentrates for animal feeding, so that the manufacturers of ready-mixed feeds know the composition of the yeast and have no difficulty in determining the quantity to be incorporated into their products.

The fact that a mixture with yeast yields better results in animal feeding than can be obtained by feeding each ingredient separately is another proof of the great value of yeast as a supplement. In a paper delivered at Kiel University in February, Professor Nehring said that this effect was particularly noticeable with yeast and corn; while, taken separately, each had a biological value of 70, that of the mixture was 78. In his book on poultry feeding, Professor Römer reports that the feeding of a mixture of yeast, fish meal and dried buttermilk resulted in maximum egg production and was more successful than the separate feeding of each ingredient. Professor Römer ascribes the success of yeast in poultry farming above all to the fact that the vitamins and enzymes contained in the yeast stimulate the activity of the gonads and thus bring about an increased egg production, while at the same time the resistance to diseases in general is markedly improved.

In trout hatcheries, spleen has so far been found to constitute the best feed. If the results obtained with spleen are taken as 100, pure yeast, by comparison, has a value of only 62. A mixture of 1 part spleen with 2 parts yeast, however, scores 140. By the result is meant the over-all success—namely, the number of trout hatched on the one hand, and losses due to disease on the other.

During the last war, feed yeast in Germany was highly successful in the form of so-called army fodder preserves. About 280,000 short tons of these pressed cakes containing 40 percent oats, 30 percent hay and chopped straw, 20 percent potato flakes and bran, and 10 percent yeast were produced annually, and delivered in units of 5 kilos. So great an importance was attached to these preserves that submarines took them to Narvik and airplanes carried them to Crete. Thorough experiments showed that the muscular strength of horses responded to yeast feeding particularly well.

As fowls are especially prone to deficiency diseases caused by a lack of B-vitamins, the case for the use of yeast in poultry farming is strong. Observations made in Norway last year showed that leg deformities were likely to occur in chickens when yeast was eliminated from their diet. Feeding with yeast had its best effects during the first 4 to 5 weeks after hatching: it brought about higher gains in weight, better growth and decreased mortality. For the fattening of ducks, too, yeast is today considered indispensable.

TABLE 2. — TWO TYPICAL QUALITY-MARKED ANIMAL FOODS

Type	Percentage
Protein concentrate [1]	
Cod meal	20
Fish meal	20
Dried yeast	15
Soybean, crushed	15
Alfalfa leaf meal	10
Fish solubles	5
Meat meal	5
Bone meal, gelatin not extracted	5
Mineral salt mixture with stable vitamin D_2	5
Ready-mixed fodder [2]	
Milo, crushed	35
Whole wheat meal	15
Barley, crushed	12
Fish meal	12
Oats	6
Wheat germ meal	6
Dried yeast	5
Alfalfa leaf meal	5
Linseed meal	2
Mineral salt mixture with trace elements and added vitamins	2

[1] For hogs, calves and poultry. [2] For sows and pigs

At Kiel, where the use of yeast for the fattening of hogs has been studied, gains in weight were found to result from better feed utilization rather than from the animal's greater appetite. This is of particular importance to countries such as Germany which, because of their limited fodder supplies, depend on imported feeding-stuffs. The better feed utilization must no doubt be ascribed to the effect of the active factors contained in the yeast. The decline of pig mortality thanks to yeast also deserves special mention. In large-scale experiments made on a farm in the lower Rhine valley yeast reduced the mortality of pigs before the seventieth day from 21.4 to 10.3 percent. Yeast has, moreover, proved useful in the rearing of fur bearers. Trial feeding of 136 silver foxes with yeast resulted in an increase in the number of living puppies from 1.1 to 3.2 per she-fox.

Table 2 gives the composition of a ready-mixed fodder for sows and pigs and of a protein concentrate for hogs, calves and poultry.

Table 3 shows examples of a protein concentrate and chick starter. The protein concentrate contains 25 percent yeast, so that the yeast proportion in the starter, a mixture of high-quality ingredients, is 5 percent. These examples will suffice to show how fodder-yeast is being used in Germany.

TABLE 3. — EXAMPLES OF A PROTEIN CONCENTRATE AND A CHICK STARTER

Type	Percentage
Protein concentrate	
Dried yeast	25
Cod meal	20
Soybean, crushed	20
Dried skim milk	20
Fish solubles	15
Chick starter	
Protein concentrate, mixture as above	20
Ground milo	20
Wheat meal	15
Ground feeding-wheat	10
Rusk	10
Wheat bran	10
Barley germs, crushed	5
Carrot chips, dried and ground	3
Sugarbeet chips, dried and ground	2
Alfalfa leaf meal	2
Feeding-lime	2
Crushed charcoal	1

Mention should be made of the fact that the high ergosterol content of yeast (about 0.4 percent) prompted the adoption of ultraviolet irradiation, by which ergosterol is converted into vitamin D_2. When cows are fed with this irradiated yeast, their milk is rich in vitamin D. The vitamin D contained in irradiated yeast keeps stable for many years. A plant has been started in which ergosterol is extracted from yeast and converted directly into vitamin D, which may then be employed in precisely the desired quantities. In addition to ergosterol other valuable substances, such as lecithin and nucleic acid and their derivatives, can be obtained from yeast.

Conclusion

Being able to produce this yeast of unique nutritive value in commercial installations, we are in the possession of a potential weapon with which to fight the evils of hunger and famine. It is only potential, because yeast is an extremely complex material about which we still have much to learn in and out of the nutrition field. Nevertheless, there are hopes that research will reveal increasingly the great possibilities to improve by its means, the living-standards and life-expectancy of hunger-stricken men and women all over the world.

Research to Increase Logging Efficiency

by A. Koroleff,
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Logging has not yet received its proper share of the benefits of science and engineering and, generally speaking, it is lacking in efficiency. Although it is heavy work, logging still depends principally on the muscle power of men and animals; even in industrialized countries, logging mechanization often lags behind mechanization in many less strenuous occupations. For instance, in eastern Canada and in the northeastern part of the United States, during conventional logging each bolt or log is often handled between five and seven times, which corresponds roughly to moving from four to six tons of wood manually for each cubic meter of wood produced.

It is as well to remember that throughout the world much more manpower and money are spent on logging than on all other forest management activities, so that the cost of logging usually constitutes the principal part of the cost of wood production. Increase in the efficiency of logging would be the best means of reducing this cost, or at least of checking its rise.

Theoretically, the possibilities offered by research devoted to the promotion of logging efficiency are almost staggering. The reality, however, is far less impressive, as it is determined by provisions for such research, by its planning and execution, and by proper application of the findings: in all these aspects there is certainly much room, and great need, for improvement. Since the field of logging efficiency research is vast and the available facilities small, it is particularly important to apply the principle of dealing with first things first and to consider carefully where attention should be centered.

Categories of research

Logging efficiency research may be divided into two categories:

(*a*) improvements of logging practice by a better choice and use of the available means and methods of logging;

(*b*) the finding of new, considerably more efficient means and methods in place of those now employed.

For convenience of reference, logging efficiency research of the first category will be called evolutionary or "E" research, and that of the second class revolutionary or "R" research. Since a clearcut division between these two classes is not always possible, an intermediate or "I" class will also be recognized.

There are important differences between "E" and "R" research. The first pertains essentially to improvement in the management of logging operations, aims at the betterment of current routines and usually results in a gradual, relatively slow increase of efficiency. In contrast, the "R" class of research pertains to developments, inventions and discoveries that can lead to sudden far-reaching changes and rapid gains in efficiency. Successful cases of such revolutionary research can be likened to such leaps in the change of characteristics of a certain species as are caused by some mutations and which are of paramount significance in genetics. While the potentialities of class "R" research are great, their attainment is difficult, and rapid progress in this field calls for different, much more substantial research provisions than those needed for "E" research.

This distinction can be shown by consideration of some of the problems that are typical for the "E", "I" and "R" classes of research, and some of the factors pertinent to each class.

"E" research

One of the great, intrinsic difficulties of logging is that in all its phases the productivity of the workers is affected by many variables. Varying factors which affect the workers' efforts change continuously. Even though the processes are repetitive, various adjustments are constantly necessary to meet the needs of efficiency and safety.

Logging production per man-hour depends on such factors as the primary products to be made from trees, the tools and techniques, the physique and skill of the worker, the basis of remuneration and the degree of his application to his work, by the accessibility of the place of work, and many other technical, economic, human and physical factors. Some of the latter are the following: tree species, diameter, degree of branchiness, form factor, defectiveness, stand density, wood volume per unit of area, underbrush and other obstacles, topography, bottom, climate, season of the year, and weather. Great differences with regard to many of these factors are often found even within a very short distance. Moreover, the efficiency of logging as a wood harvesting process may be seriously affected by the requirements of silviculture and forest protection, such as the prescribing of a certain cutting method and provisions as to slash disposal.

Many studies have been conducted, on a local or regional basis, to determine the effect of certain factors in the operating conditions and practices on the rate of output in woods work. Much of "E" research is directed towards the elimination of waste effort through time and motion studies, but most of it has probably been intended to provide an adequate guide for manpower and cost estimates in logging, for the needs of planning and cost control, and, particularly, to provide a proper basis for piece work rates and for collective work and wage agreements between woods labor and its employers.

Research on the correlation of the variable factors in logging conditions with the rate of output is, with

some exceptions, more of an aid to sound administration of operations than a means for achieving rapid increase in efficiency. [1]

" I " research

A good example of this class of research is constructive analysis of the annual logging cycle in those operations where seasonal influences constitute an important or even controlling factor. Considerable gains in efficiency should often be possible by means of improved adjustments in the use of labor and better choice of techniques for specific kinds of work at certain times of the year.

A thorough, critical analysis of the framework of logging operations, with a view to an increase in their efficiency, is a fertile but a difficult field for research. Such a problem usually has many roots in the areas of labor choice and management, of logging techniques and machinery, and of forestry. Closer integration in the management of both labor and of the forest is badly needed. The improvements required are usually not single steps but sets of interrelated measures which must be introduced together.

The subjects just mentioned do not lend themselves fully to constructive study on a very broad basis. In class " I " as well as class " E " research, each logging operation usually needs special study, on account of its particular complex of conditions and requirements.

" R " research

Certain widely-used logging practices are intrinsically inefficient, though this fact is not always obvious. Here there is a definite need for revolutionary research to diagnose the situation correctly and to find a sound solution.

A good illustration of an inefficient logging method is the use of draft animals in skidding timber down steep, rough hillsides. A strenuous and slow ascent and a difficult descent have to be made for each small load, while the work calls for merely one-way, downhill transport which can be accomplished by gravity. Since chutes, cableways and such other means are economically justified only with concentrated operations, the Pulp and Paper Research Institute of Canada has in recent years conducted some research on the development of a simple and cheap method of transporting wood down excessively steep slopes, by its own weight, over a suspended singlestrand, strong steel wire — with gratifying results.

While logging mechanization, where applied effectively, has greatly increased the total efficiency, much research of the " R " type is needed to improve further logging machinery and techniques. For example, crawler tractor skidding is usually done either by dragging timber directly behind the tractor, in spite of great load resistance, or by pulling loads which are semi-suspended from a trailing arch or a sulky behind the tractor — with the addition of considerable deadweight and a loss of manoeuvrability. Both of these procedures have substantial intrinsic weaknesses. If semi-suspension of the load were provided not by a trailing arch but by a suitable change in the construction of the tractor, the decrease in the load resistance would combine happily with a considerable gain in the machine's pulling power, by an increase of its traction. The soundness of this simple reasoning is supported by some American research of eight or nine years ago (United States Forest Service Tomcat tractor) and by recent Russian experience with such special skidding tractors (KT-12 and ETT-1 models).

The development in the United States of the bulldozer and its wide adaptation in many countries in the construction of forest roads is a case of a revolutionary change which resulted not only in great gains in logging efficiency but also in broader benefits to forest management.

The gains from " R " research are usually much greater than those resulting from the " E " or even " I " classes, not only on account of more beneficial changes but because of much wider applicability of those changes. Yet the task involved in revolutionary research is usually more difficult and calls for greater investment in facilities and development work.

Research provisions

A considerable list of substantial increases in efficiency of logging through " R " research could be given and a still longer list of important problems which are waiting for solution. The degree of future progress will depend on the planning and the provisions for research — not only on the total funds and effort to be invested but on their allocation. [2]

Let us consider, in this connection, two different kinds of research provisions:

(*a*) well-organized endeavors by means of centralized efforts (forest research organizations aiming at increase of logging efficiency), which can be designated as research provisions of " C " class (centralized);

(*b*) relatively casual efforts which may be called dispersed or " D " endeavors.

These two kinds of research provisions differ greatly as to their possibilities. With " C " provisions, research is normally conducted under careful planning by qualified personnel, who work steadily with good facilities. In contrast, dispersed research in logging efficiency depends principally on those whose main duty is not research; it is often done rather casually on a part-time basis and under various handicaps. The effectiveness of the work under " C " provisions — whether on a per hour or per dollar basis — is probably much greater, but due to a lack of organization and co-operation and the very great numerical superiority of class " D " research workers, most of the time, effort and funds expended in all research are too thinly spread and much of the work is dissipated.

Both classes of research are of course necessary, but the " D " type does not lend itself sufficiently to such difficult, substantial studies as are usually needed for clearcut solutions of the most important problems in logging efficiency.

[1] See *Unasylva*, Vol. VII, No. 2, p. 81, "Logging Techniques and Training of Forest Workers" (*Work of FAO*).

[2] See *Unasylva*, Vol. VII, No. 2, p. 96, *Logging Mechanization in the U.S.S.R.* by A. Koroleff (*Selected Reviews*).

Conclusion

In the writer's opinion, the following are the main courses that need to be followed:

1. Consideration and definition of the tangible research problems, the solution of which would contribute most to an increase in logging efficiency in the country concerned.
2. Endeavor to increase and further to improve the provisions for organized, centralized research.
3. Increase in the emphasis on the revolutionary class of research by forest research organizations, even if at the expense of evolutionary research ("RC" combination being usually more efficient than "RD"). Since they are in a good position to evaluate and to develop them, such organizations can act as a magnet for attracting from many quarters various constructive, revolutionary ideas on the promotion of logging efficiency.
4. Encouragement of those engaged in dispersed research endeavors to deal directly with the evolutionary type of research, and to deal with the other kinds in co-operation with the forest research organizations or through them (since "ED" usually tends to be more effective than "EC", in so far as certain important local conditions are concerned).

LIST OF ABBREVIATIONS

United Nations

ECOSOC Economic and Social Council

Economic Commissions

ECAFE	Economic Commission for Asia and the Far East.
ECE	Economic Commission for Europe
ECLA	Economic Commission for Latin America.

Specialized Agencies

FAO	Food and Agriculture Organization
IBRD	International Bank for Reconstruction and Development
ILO	International Labour Organization
IMF	International Monetary Fund
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNKRA	United Nations Korean Reconstruction Agency
UNRWA	United Nations Relief and Works Agency
WHO	World Health Organization

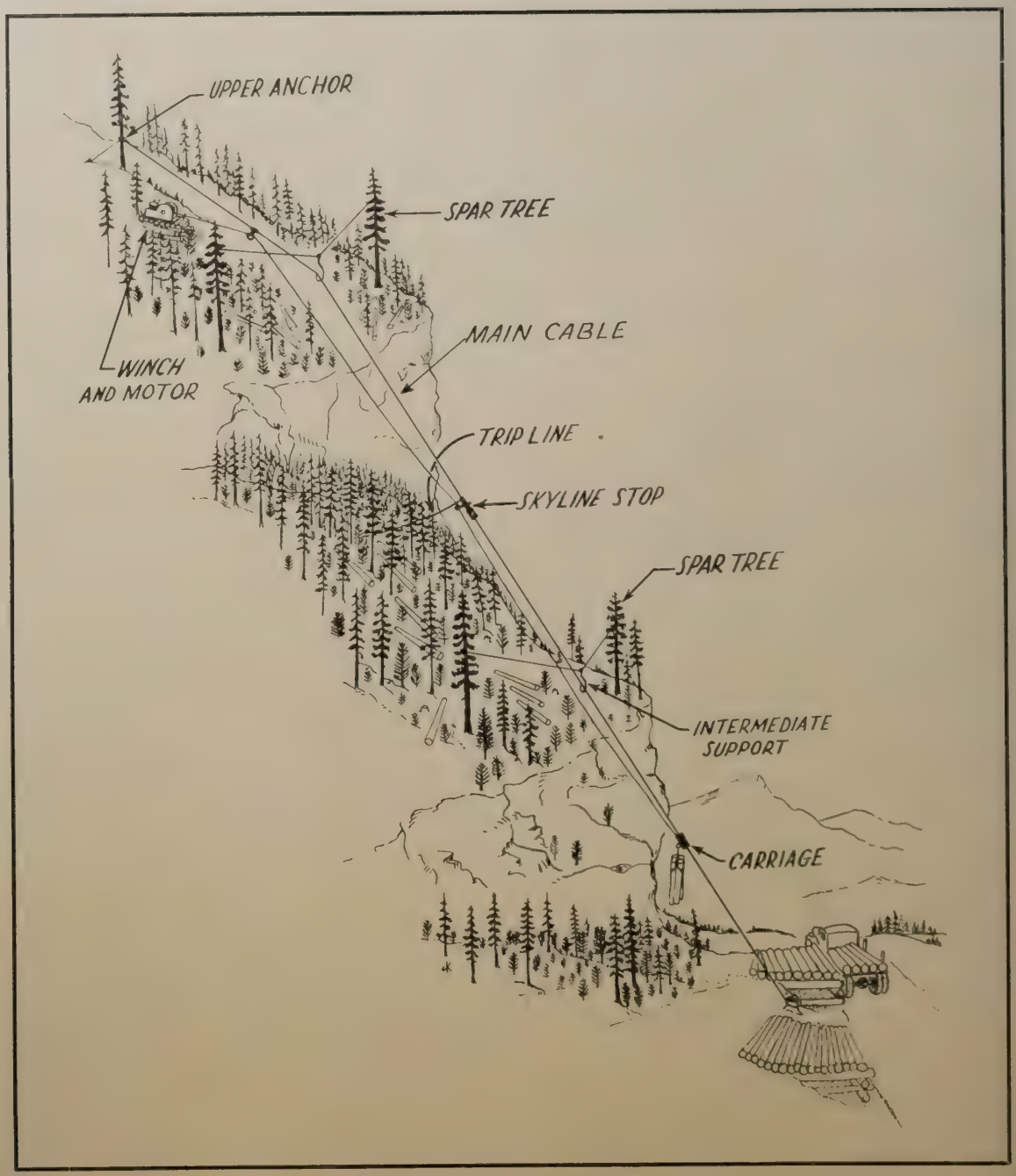

Diagram of a skyline crane in action

Extraction of Timber by Skyline Crane

by A. H. Lloyd,
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Mechanization of the extraction of timber from difficult sites by the use of the Wyssen cable system or skyline crane has aroused much interest during recent years. It is a Swiss invention originally designed for logging from Alpine forests but it is now used over a wide range of forest types and conditions, from softwood forests in Canada to tropical hardwoods in the Sudan and other parts of Africa, and also, recently, in mangrove swamps in Asia. During the present year it has been installed for the first time in New Zealand and in Scotland for the extraction of thinnings from softwood plantations.

It is the purpose of this article to examine briefly the capabilities and limitations of the skyline crane from the forestry point of view, particularly in regard to the terrain and the type of forest.

The skyline crane is a cable system but differs from all other cableways in that it is a travelling crane and can pick up loads directly from the ground at any point along the cableway. It can also haul in logs from a limited distance on either side of the cable. It therefore combines the uses of the well-known American skidder with transport by gravity cableway. The operation is simple, as can be seen by reference to the diagram.

The Wyssen system consists essentially of a single fixed main cable or skyline along which runs a specially designed carriage or travelling crane. This carriage is controlled by a light operating cable connected to a yarder, which is a portable winch with a small engine assembled as a single unit on skids. The yarder is anchored near the upper terminus of the cableway, as shown. When the carriage reaches the point along the cable at which it is desired to collect a load, a special skyline stop, controlled by a light trip-line from the ground, halts the carriage and, on contact, automatically releases the choker-hook which falls slowly to the ground, attached to the end of the operating cable.

The choker-hook is then carried by hand and attached to the load which may be a single log or a number of small logs bundled ready with choker-cables. At a given signal to the winch operator, the load is hauled upwards to the carriage-crane on the main cable, as shown in the third illustration, where a single two-ton log is being hoisted up to the carriage coupled to the skyline stop. As soon as the special chokerhook strikes the base of the carriage, an automatic release frees the "stop" from the carriage which, with the suspended load, then slides down the cable by gravity to the off-loading point, the speed being controlled through the operating cable by the brakes on the winch-drum. In the diagram the carriage is shown approaching the off-loading point after being released from the skyline stop seen halfway up the cable.

The diagram shows an ideal topographic profile for a skyline operation. The forest is very open and has suitable tall trees to form natural supports for the cable and also to provide firm anchorages. In dense even-aged forests, particularly in young plantations, the lack of suitable spar trees or natural anchorages adds considerably to the labor involved in installation, but a log buried horizontally a few feet in the ground can provide a good alternative anchorage. Skidding timber from either side of the cable is also difficult in very dense young plantations and short feeder tracks may have to be cleared and the timber ground-skidded by man or horse to these tracks. The current practice in Scotland to bring out softwood thinnings in their full original lengths entails the use of very high supports and adds considerably to installation difficulties as the bundled poles are carried vertically.

In open high forest practically no harm or damage to the remaining stand is caused by skyline logging, and it has indeed often been proved that much less damage is caused than with ground skidding by man or horse, especially on hill slopes where soil erosion can also frequently be caused by tractors and dragging paths.

The skyline can extract timber either uphill, downhill or on level ground. The steepest safe gradient for the cable is 45 degrees (or 100 percent) between supports: where a mountain side is too precipitous the lower anchorage may be sited at some distance from the foot of the slope in order to reduce the cable gradient. The minimum slope for operating by gravity is about 8 degrees and, if less than this, a second winch-drum may be needed to haul the operating cable.

The maximum distance between cable supports depends on the weight of the load and the gradient; the smaller the slope the deeper is the catenary curve and therefore the closer together the supports must be to keep the load off the ground. This is one of the disadvantages in using the skyline on level or almost level terrain and can only be countered by increasing the normal tension on the main cable.

Logging uphill from a deep valley or ravine offers less difficulty than from level ground. The arrangement of cables is the same but the loads are hauled up the main cable by the yarder.

The average normal load is limited to 1½ tons although occasional logs of 2 tons may safely be extracted. A heavier model to take 10-ton loads is now being designed, but this will entail very heavy cables and reduce the portability and simplicity of the equipment. The present model is designed for rapid installation by ordinary workers without any previous mechanical knowledge, but several weeks' special training under experienced operators is essential. Five experienced men can install a skyline cableway in from 3 to 14 days, depending on the length of cable and the availability of natural supports. The ordinary operating distance is up to 1½ miles (2.5 km.) long.

Choker-hook with a bundle of logs being hauled in to the main skyline.

The skyline crane promotes intensive utilization of the forest as. when installed for logging, additional small material such as firewood can often be extracted at a profit. Forests badly damaged by fire, insects or wind can be cleared quickly, although windfelled areas create special difficulties in operation. The output of timber per man-day is high and operations can continue in all weather except deep snow.

Costs of extraction of timber by skyline crane are difficult to compare with other means of transport as the skyline is generally used in forests inaccessible by other methods or where costs would in any case be much higher than the average, particularly if hillside roads have to be constructed and maintained.

The equipment is costly as it has to be light in weight but strong enough to withstand rough usage in the forests. Breakdowns in an overhead crane would be both dangerous and difficult to repair, away from workshops. The controlling yarder has to be sensitive to sudden changes of stresses and speeds due to logging operations which are out of sight and often at the end of a mile of cable. This necessitates expensive multiple gears and special braking equipment, and the initial cost of a complete skyline crane is therefore high. The costs of operation and maintenance are, however, very small in comparison with tractor operations, and the equipment has a much longer life.

A two-ton log being hoisted up to the skyline crane carriage.

Actual costs of extraction per cubic meter of timber vary too greatly with local conditions to be usefully quoted here, but figures are obtainable for forests in several European countries and in Canada.

(*Continued from page 151.*)

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Forest Policy in South Africa

A report submitted to FAO by the Government of the Union of South Africa

Forest policy in South Africa, as in most countries, was built up gradually with the development of the country. As the need arose to control exploitation of the country's forest resources, to increase and protect its forest estate and to protect its water supplies and soils, so the necessity also arose for an adequate forest policy and appropriate legislation.

The services of the Count de Vasselot de Regné, a trained French forester, were obtained in 1880 and he was appointed Superintendent of Woods and Forests for the then Cape Colony. Previously, the forestry resources of the country as a whole, their conservation, proper utilization and management had received but scant attention. There was an absence of suitable legislation with regard to forestry matters and furthermore the staff was insufficient to enforce even such legislation as existed.

From 1880 onwards, the foundations were laid of what has developed into the present forestry organization. The administration has been placed on a sound basis, scientific methods of management and exploitation have been introduced, and a comprehensive afforestation program has been initiated.

Conformity with FAO Principles

It will be useful to examine to what extent the progress made in South Africa is consistent with Resolution No. 26 regarding " Principles of Forest Policy ", adopted by the Sixth Session of the FAO Conference at Rome in 1951.

Each country should determine and set aside areas to be dedicated to forests whether at present afforested or not.

The Union is a comparatively poorly timbered country and, although fairly considerable areas of forest or scrub are known to have disappeared within the last century or two, because of overcutting, overgrazing, native cultivation of the land and fire, there appears to be no reason to believe that it has ever been, as a whole, a heavily timbered country during the present geological period.

The forest-clad areas occupy some 3.7 percent of the total land area, 0.4 percent being under indigenous high forest, 2.7 percent under scrub and savanna forest and 0.6 percent under plantations of exotic species.

Forest policy for the past seventy years has aimed at building up an appropriate forest estate. The area of Crown lands reserved for forestry purposes and controlled by the Department of Forestry as at 31 March 1952, is shown in Table 1.

Table 1. — Area of Crown Lands Reserved for Forestry

Crown lands	Acres	Hectares
Indigenous forests	624 234.5	252 628
Plantations (exotic species) ..	475 252.5	192 335
Open driftsands	32 778.2	13 265
Unafforested areas:		
not suitable or available ..	2 358 775.8	954 597
available for afforestation ..	327 320.0	132 466
Total ...	3 818 361.0	1 545 291

The small area of indigenous high forest is composed almost entirely of very slow-growing hardwoods which are unsuitable for the main industrial and commercial requirements of the country.

Experimental planting of a very large number of exotic species from 1880 onwards had proved, by the beginning of the twentieth century, that a number of them were well suited to the soils and climate of the Union. The needs of the gold and coal mines for props were met by afforestation with suitable fast-growing eucalypts and exotic acacias. As it was certain that private forestry could and would meet the demand for products of this type, afforestation by the State aimed primarily at the production of softwood sawlogs.

A rapid increase in the rate of afforestation with conifers was inaugurated by the State after the first world war, and by 1939 about 16,000 acres (6,500 ha.) were being planted annually. During the war years, 1939-1945, afforestation was drastically curtailed. During the past five years the average annual rate of afforestation by the State has been approximately 15,000 acres (6,000 ha.). The Forest Department has set down as its goal an annual rate of afforestation of 30-35,000 acres (12-14,000 ha.), but due mainly to the present serious staff shortage it has not yet been possible to achieve this target.

In accordance with the State's policy to make the country self-supporting eventually in regard to timber supplies, the Department plans to extend its afforested area to 1,250,000 acres (506,000 ha.) of which 1,000,000 acres (405,000 ha.) will be conifers.

The critical shortage of timber during recent years and the development of primary wood industries has focussed public attention on the need for an extended afforestation program. There are considerable areas in the regions of high humidity which are of very little use for pasture, of less use for agriculture but suitable for production of timber. These conditions particularly prevail in certain native territories and the part that

forestry could play in the social and economic rehabilitation of such areas is receiving the attention of the authorities.

In order to encourage the establishment of farm woodlots and shelter belts, the Government introduced a scheme whereby any *bona fide* farmer can purchase transplants up to a maximum of 12,500 in any one year from the nurseries of the Department of Forestry at a price very much below cost. Although the greater part of the Union has a rainfall which is too low to justify afforestation on a commercial scale, experimental work has shown that shelter belts of hardy species can be established in all but the most arid regions.

Table 2 gives a comparative statement of the total area of plantations of exotic species for the years 1946 and 1950, under State, communal and private ownership:

TABLE 2. — TOTAL AREA UNDER EXOTIC SPECIES, 1946 AND 1950[1]

Ownership	Species	Area in square miles		Percentage of total area	
		1946	1950	1946	1950
State	Conifers	457	570	74.3	79.7
	Eucalypts	86	95	14.0	13.3
	Tan wattles	19	18	3.1	2.5
	Poplars	2	3	0.3	0.4
	Other hardwoods	51	29	8.3	4.1
	Total	615	715	100.0	100.0
Communal	Conifers	21	32	17.2	19.6
	Eucalypts	36	45	29.5	27.6
	Tan wattles	54	56	44.3	34.4
	Poplars	3	4	2.5	2.4
	Other hardwoods	8	26	6.5	16.0
	Total	122	163	100.0	100.0
Private	Conifers	166	254	10.2	14.7
	Eucalypts	519	449	31.7	26.0
	Tan wattles	790	895	48.4	51.7
	Poplars	51	43	3.1	2.5
	Other hardwoods	109	88	6.6	5.1
	Total	1 635	1 729	100.0	100.0
Total	Conifers	644	856	27.1	32.8
	Eucalypts	641	589	27.0	22.6
	Tan wattles	863	969	36.4	37.2
	Poplars	56	50	2.4	1.9
	Other hardwoods	168	143	7.1	5.5
	Total	2 372	2 607	100.0	100.0

[1] 1 square mile = 259 hectares.

Each country should apply the best practicable techniques in seeking to derive in perpetuity, for the greatest number of its people, the maximum benefits available from the protective, productive and accessory values of its forests.

Protection

The resources of the Department of Forestry, in terms of both men and money, are generously devoted to activities which are not revenue-producing except in a broad national sense. The conservation of watersheds, erosion control, driftsand reclamation, the patrolling, protection, improving and administration of large areas of indigenous forest may all be regarded as falling legitimately within this category.

The primary protective functions of the Department of Forestry are briefly as follows:

1. The protection and conservation of indigenous forests and their utilization in such a manner as not to impair, but rather to increase, their future productivity. Funds voted for this purpose are mainly spent on protection from fire and on regeneration.
2. The protection of important catchment areas to conserve water supplies. Of the 3,818,361 acres (1,545,290 ha.) of land controlled by the Department of Forestry, 2,358,776 acres (954,600 ha.) are held mainly for the protection of water supplies. Extensive areas on mountain ranges comprising the sources of important rivers are protected as far as possible against fire and grazing. Control is gradually being extended to other areas of importance, Crown land being reserved for the purpose where necessary, and in some cases privately-owned mountain ground constituting catchment areas of importance being acquired by purchase.
3. The prevention and reclamation of drift sands. Along the coast from the Cape to Zululand are forest reserves which are held for the prevention and reclamation of drift sands.
4. The establishment and maintenance of nature reserves within the forest areas the object of which is to maintain in their natural state for all time special features of the flora or of the landscape, in the interests of scientists and nature lovers of the present and future. At present the aggregate area covered by these nature reserves amounts to some 12,800 acres (5,180 ha.).

Production

The technical aim of forest management is to attain a normal distribution of age-classes in each complete forest unit. In the case of State-owned areas, all extensions of afforestation have been regulated by approved surveys and planting plans. As intermediate yields become available, thinning and pruning plans with estimates of yield are prepared. In the oldest plantations these plans are replaced by complete working plans which provide for a systematic regulation of the yield and attainment of a normal series of age-gradations.

Privately-owned hardwood plantations grown on short rotations of six to ten years are intensively managed even though no working plans in the conventional sense are drawn up for them.

On account of the fact that the indigenous forests of the Union have been largely over-exploited in the past, are small in extent and relatively unimportant as a source of timber requirements, their main contribution is to be sought in directions such as water conservation and popular recreation.

While the present annual yield of softwood timber from State plantations is approximately 19 million cubic feet (538,000 m³), this will progressively increase from year to year up to a future total of some 180-200 million cubic feet (5.1-5.7 million m³) per year.

It is estimated that the total output of wood from State, communal and private plantations for the calendar year 1950 was as follows:

TABLE 3. — TOTAL TIMBER OUTPUT, 1950

Class	Estimated volume (1,000 cu. ft. [1,2])	Estimated value (£1,000)
Softwood sawtimber	27 359	1 185
Hardwood sawtimber	6 359	
Mining timber and poles	34 157	969
Pulpwood	3 758	30
Firewood	28 319	177
Charcoalwood	582	4
	100 534	2 365

[1] Roundwood equivalent, true measure underbark.
[2] 1 cu.ft. = 0.02832 m³.

The output of the various classes of wood mentioned in the above Table includes wood from the indigenous forests. In 1950, the total output of all classes of wood from these forests amounted to only 2,918,000 cubic feet (82,640 m³). Values of wood from communal and private plantations have been based on average value figures for State plantations.

The position in regard to the total gross imports and exports (including South African produce) of wood and wood products for the year 1950 is summarized in Table 4.

TABLE 4. — TOTAL GROSS IMPORTS AND EXPORTS OF WOOD AND WOOD PRODUCTS, 1950

Class	Estimated volume (1,000 cu.ft [1,2])	Value f.o.b. (£1,000)
Imports		
Primary products	42 422	8 916
Derivative products	19 000 (approx.)	10 022
Total	61 422	18 938
Exports		
Primary products	1 316	301
Derivative products	not available	1 535
Total	not available	1 836

[1] Roundwood equivalent, true measure underbark.
[2] 1 cu.ft. = 0.02832 m³.

The total estimated home consumption of wood and wood products during the year 1950 is given in Table 5:

TABLE 5. — ESTIMATED HOME CONSUMPTION OF WOOD PRODUCTS, 1950

Class	Estimated volume (1,000 cu. ft. [1,2])		
	Local output	Net imports	Total
Primary products:			
softwoods	29 281	31 280	60 561
hardwoods	71 253	9 826	81 079
Total	100 534	41 106	141 640
Derivative products	—	19 000+	19 000+
Grand total	100 534	60 106	160 640
Percentage	62.6	37.4	100.0

[1] Roundwood equivalent, true measure underbark.
[2] 1 cu.ft. = 0.02832 m³.

Without going into a detailed analysis of the above Tables, the fact remains that the yield of local plantations is making a significant and increasing contribution to the timber requirements of the Union.

Reference has also to be made to the wattle industry, which is concerned with the production of tanbark and tanning extract from trees of the genus *Acacia* of Australian origin. This industry is in the possession of a large and well-organized export trade and is also the largest of the local forest industries to be maintained almost exclusively by private enterprise, having a total afforested area of more than half a million acres (200,000 ha.).

The tonnage and value of bark and bark extract exported annually for the period 1946-1950 is summarized in Table 6.

TABLE 6. — ANNUAL EXPORTS OF BARK AND BARK EXTRACT, 1946-1950

Year	Quantity		Value (f.o.b.)		Total value (f.o.b.)
	Bark	Extract	Bark	Extract	
	(*short tons*) [1]		(£ *1,000*)		
1946	59 114	71 782	548	1 418	1 966
1947	56 117	87 084	635	2 192	2 827
1948	67 716	100 592	1 041	3 359	4 400
1949	69 922	104 756	1 181	3 780	4 961
1950	56 647	90 577	991	3 379	4 370

[1] 1 short ton = 2,000 lb. = 0.9072 metric tons.

Exploitation, conversion and utilization

The sawmilling industry in South Africa made tremendous strides during the war period. A few years before World War II the industry was still confined to some small plants dealing with comparatively insignificant quantities of timber from indigenous forests and in a small way with plantation grown pine timber. The war, however, created an unprecedented demand for locally grown timber. This demand continues and during 1951-52 State plantations alone yielded 20,304,636 cubic feet (575,000 m³), of which 7,369,454 cubic feet (208,700 m³) was sawn at State sawmills and 12,935,182

cubic feet (366,300 m^3) was sold in the log to private sawmills. The policy followed in regard to the disposal of softwood sawlogs produced in State plantations is that future yields will be allocated equally between State sawmills and private enterprise.

State preservative plants also play an important part in supplying treated round timber for many purposes, such as chemically impregnated transmission, telephone, building and fencing poles.

Until recently, logging in South Africa had been limited to manual means with the help of animals and trek chains as accessories. During the past 12 years crawler tractors have been used in plantations principally for the purpose of moving thinnings to roadsides. On one or two clearfelling operations, manganese steel skidding pans and wire rope chockers have been employed successfully and 30 h. p. tractors have been equipped with single-drum wire rope winches. Since then " Loggers Dream " units and " Wyssen Skyline Cranes " have been introduced and are operating satisfactorily.

With a demand for sawlogs, smallwood — below 5 inches, (12.7 cm.) down to 3 inches, (7.6 cm.) top diameter — mining timber, pulpwood, poles, posts and fuel, the road to fully integrated utilization is now open, particularly in the Transvaal and Natal Provinces, where the demand for all these items exceeds the supply.

Adequate knowledge of all aspects of forest resources, forestry, and the consumption and utilization of forest products, is indispensable.

The Department of Forestry employs fully qualified professional staff to direct the various operations connected with forest management, development of forest resources and the consumption and utilization of forest products. Forest research is fully organized to keep pace with all developments in the fields concerned.

Public consciousness of forest values should be developed by all means possible.

Forestry education and extension services are facilitated by the Department of Forestry. In this connection forestry exhibits are staged at agricultural shows throughout the Union, lectures on forestry are given at various agricultural colleges and farmers unions. Numerous requests for advice relating to forestry matters are received and dealt with. To deal with the extended interest shown in forestry, the Department recently reinstated the post of Extension and Propaganda Officer.

Implementing Forest Policy

Forest law

Since 1913, when the Forest Act of 1888 (Cape Colony) was repealed, the administration had been carried out under the Forest Act No. 16 of 1913 as amended by Act No. 14 of 1917 and Act No. 28 of 1930. In 1941, the Forest and Veld Conservation Act (No. 13 of 1941) was passed to amend and consolidate the laws in the Union relating to the tenure, demarcation, protection, management and utilization of forests and the regulation of veld-burning; to regulate trade in, and the use of, trade names and marks in connection with forest produce; to control the exploitation and importation thereof; and to make better provision for veld, soil and water conservation. In 1946, the passing of the separate Soil Conservation Act (No. 45 of 1946) resulted in the title of Act No. 13 of 1941 being shortened to that of The Forest Act. A further brief Act (No. 10 of 1948) was passed to facilitate certain aspects of the administration of land controlled by the Department and also to strengthen the position of owners of land in cases where damage resulted from the kindling of fires.

The Acts referred to above were important factors in promoting forestry and its associated industries in South Africa and also did much to prevent the reckless destruction of the indigenous forests, soil and water resources of the country.

A forest service

Until 1876 no central or technical control was exercised over the Crown forests of the Cape Colony, but in that year a Department of Forests and Plantations was constituted, and in 1881 a superintendent of woods and forests was appointed. In 1891 this post was abolished, and the four conservancies into which the Colony had been divided were thereafter administered independently by four conservators, who were responsible to the Secretary for Agriculture. In 1905 a chief conservator of forests was appointed who was responsible to the Minister. The Crown Colony Governments in the Transvaal and Orange Free State established forest departments as divisions of the respective agricultural departments about the year 1903. In Natal, no settled policy was followed, but the post of conservator of forests was created twice and abolished, the administration of the forests being in the hands of the Director of Agriculture from 1908 onwards. When the Union of South Africa was established in 1910 the four forest departments were immediately combined under one chief conservator of forests, later named the Director of Forestry. In October, 1934, the Forest Department was combined with the Department of Agriculture under the title of the Department of Agriculture and Forestry, and a Division of Forestry was established under the Director of Forestry. This arrangement continued until October 1945, when forestry was divorced from agriculture and reinstated as a separate department.

The Union is divided into seven forest conservancies and in charge of each is a conservator of forests. Each conservancy consists of a number of forestry districts controlled by district forest officers, each of whom has under him a number of foresters in charge of forest patrols.

At headquarters, officers are allotted to the management of the forest estate, utilization of the forest crops, statistics, forest education and extension services.

The activities of research fall into the following categories:

1. Silvicultural research, dealing with problems connected with silviculture.

2. Hydrological research: the 1935 Empire Forestry Conference recommended to the Government of the Union that a series of investigations into the influences of forests on climate, erosion and water conservation should be carried out. Before the end of that year the South African Forestry Department gave effect to that recommendation by establishing the Jonkershoek Forest Influences Research Station in the winter rainfall region of the southwestern Cape. A second research station has also been developed at Cathedral Peak in the Drakensberg, Natal, to serve the regions of summer rainfall.

3. Forest products research, centered at the Forest Products Institute, deals with problems of timber research including matters related to preservation of wood by chemical impregnation, etc.

Training of officers

Officers of the higher professional division are recruited from men who hold a degree of forestry of a recognized university. This degree is obtainable in South Africa at the Stellenbosch University after a four-year course in forestry.

Men desirous of entering the government service as foresters are trained at Saasveld Forest School, near George. The course extends over a period of two years.

Conclusion

Resolution No. 26 of the Sixth Session of the FAO Conference has therefore been noted with appreciation by foresters in the Union of South Africa. The principles embodied in this resolution are in substance identical with those originally formulated at the first British Empire Forestry Conference in 1920 and re-affirmed at subsequent Commonwealth Conferences, and they have been the basis of forest policy in South Africa for many years.

Because it has been formulated with proper regard to the interests of posterity, forest policy in South Africa in all its aspects conforms ethically to the highest national standards and these same standards guarantee that it will be steadfastly pursued in the future.

Forestry in Israel

by René Karschon,
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Israel has a land area of 20,600 square kilometers of which 49,000 hectares or 2.4 percent are set aside as forest reserves under the supervision of the Forest Department of the Ministry of Agriculture.

About 16,000 hectares of reserved land have been planted in the last 50 years, and 760 kilometers of roadside avenues and windbreaks established since the independent State was founded. Most forest reserves actually consist of maquis in a more or less advanced state of degradation due to past misuse common to all Mediterranean countries, and to consequent soil erosion.

Forest geography

Three well-defined regions can be distinguished:

1. *The Mediterranean region*, north of the Gaza-Hebron line, has a rainfall of over 400 millimeters reaching 1,000 millimeters in the mountains of Galilee. Once largely covered with forest, today there is only scrub. The coastal plain of 20,000 hectares partly bordered by shore dunes consists of brown-red sandy soils; during the last century there were still large stands of *Quercus ithaburensis*, but only isolated trees now remain. The Aleppo pine (*Pinus halepensis*) is confined to *rendzina* soils developed from the Upper Cenomanian; it is found on the western slopes of Mount Carmel and on some relic sites of Galilee and in the vicinity of Jerusalem. *Q. ithaburensis* scrub, often attaining to the form of open forest, is limited to low elevations, and also grows on *rendzina*, while on *terra rosa*, the most common type of mountain soil, *Quercus calliprinos* scrub is found. Open carob forest (*Ceratonia siliqua*) occurs both on *rendzinas* and on mountain *terra rosa*, and even on the coastal plain where it grows on weathered calcareous sandstone or on fixed sands. The course of wadis and rivers is marked by hydrophytes such as *Platanus orientalis*, *Fraxinus syriaca*, *Salix* sp., and *Nerium oleander*. Among the other species of the Mediterranean maquis, mention may be made of *Acer syriaca*, *Arbutus andrachne*, *Crataegus azarolus*, *Laurus nobilis*, *Pistacia* sp., *Quercus infectoria*, *Rhamnus* sp., and *Styrax officinalis*.

The Mediterranean region is densely populated and all land suited to farming is cultivated, partly with the aid of irrigation. The area of land suited primarily for forest is estimated at 150,000 hectares or 7.3 percent of the total area of Israel.

2. *The steppe region* (Irano-Turanian) around Beersheba, northern Negeb, is characterized by an annual rainfall of 150-400 millimeters. Deposits of aeolian loess, partly covered with sand, form the typical soil of this vast rolling plain where the most important tree is *Tamarix articulata*, although only isolated specimens are still found. In this pre-eminently agricultural region, irrigated farming and complete mechanization have displaced primitive systems of cultivating winter grains (barley).

The middle Jordan valley, between Tiberias and Beisan, and the basaltic mountains to the west of the river, are also part of the Irano-Turanian region. Annual rainfall is 300-450 millimeters. Basaltic or marly soils cover most of the region. Only isolated specimens of *Pistacia atlantica* and *Zisyphus spina-christi* are to be found.

3. *The desert area* (Saharo-Sind), southern Negeb, covers the rest of the country, south of Beersheba. Annual rainfall is under 150 millimeters and shifting sands and hammadas (stony desert plateaux) are the commonest habitats. The arborescent vegetation consists of isolated trees or clumps restricted to the wadis of the mountains and plains. The principal species belong to the *Acacia* and *Tamarix* genera. Shifting cultivation is still practised in places.

Aims of forest policy

The aim of silviculture is to establish and maintain healthy forest stands capable of fulfilling the many purposes for which they are designed. The forest must primarily perform protective functions and, in particular, protect the soil from erosion, fix shifting sands and regulate the water regime. It should also serve to produce various categories of wood for particular uses (saw timber, railway ties or sleepers, poles, etc.) and so lay the foundations for the creation of a veritable wood industry which could rapidly and profitably absorb considerable manpower. At present the existing forests cannot meet the enormous timber requirements and the country depends mostly on imports. The manufacture of " masonite " from native and imported wood waste has just been started in conjunction with a large plywood mill. A paper mill is being built which will rely initially on imported wood pulp.

Afforestation and reforestation are undertaken by the Forest Department on the land set aside as forest reserves, by national institutions such as the Jewish National Fund, by communities and by private individuals. The Forest Department's policy is to encourage every afforestation venture by the free and unlimited distribution of plants on request.

Afforestation techniques

The plants are raised in nurseries in cans, or in locally-made cement or terracotta pots. When 8-12 months old, they are transplanted with balls of earth. For the most important species only the seed of selected parent trees is used.

In the Mediterranean region afforestation is carried out on heavily eroded mountain soils that cannot grow any other crop. The species most widely employed are *Pinus halepensis, P. brutia, P. pinea, Cupressus sempervirens* and *Ceratonia siliqua*. Soil preparation consists of terracing or digging plant-holes; sometimes the two are combined. Tending after planting takes the form of several hoeings in the first two years and filling up blanks or failed areas. Good results have been obtained by direct seeding or by planting conifer seedlings. Fire lines have been established everywhere.

Subsequent operations are pruning and thinning. *Eucalyptus camaldulensis* (= *E. rostrata*) and *Casuarina equisetifolia* are utilized for roadside plantings which are given two or three waterings in the first two years. *Cupressus sempervirens* is usually adopted for windbreaks. The dunes are fixed by planting *Acacia cyanophylla* and *Eucalyptus camaldulensis*, combined with rows of *Artemisia monosperma*. Plants are dug in 40 centimeters deep so that only a few leaves show above ground; *Tamarix* sp. is propagated on dunes by cuttings and *Ricinus communis* is sown.

Eucalyptus plantations are managed in the same way as coppice with an average rotation of 7-8 years, producing different-sized poles. The thinnings of softwood stands are utilized both as poles and as sawn wood for boxmaking, etc.

Degraded natural forests are improved by prohibiting grazing by livestock, especially goats, and by underplanting with conifers where there are blanks so as to obtain a two-storeyed growing stock. Pruning, trimming and thinning are practised when necessary.

In the Irano-Turanian region, extensive afforestation has been carried out on the basaltic soils round Tiberias. Terracing and the planting of *Acacia cyanophylla* and *Eucalyptus camaldulensis* have successfully checked soil erosion and now effectively protect the town and road comunications against floods.

In the northern Negeb, considerable roadside and windbreak plantings have been undertaken since the founding of the State. Transplanting and subsequent maintenance are carried out with tractor-drawn implements. The species chiefly used are *Tamarix articulata, Eucalyptus camaldulensis* and *Acacia cyanophylla*. They are also utilized for checking erosion along the wadis that cut deep into the loess, and for fixing inland dunes.

Legislation

Since the founding of the State, the Government has given recognition to the major importance of forests for the country, and the Prime Minister has announced a plan to plant 100 million trees in 10 years. The implementation of this plan, however, at present hangs in the balance because of budget difficulties.[1]

The forest law dating from the time of the British mandate is still valid, and a revised draft prepared by the Forest Department has not yet been officially approved. A law regulating uncontrolled goat grazing has, however, already been approved by Parliament and the Forest Department is making arrangements to bring it into force.

Forestry education and research

There is no opportunity for higher forestry studies in the country and a shortage of personnel with university training is a serious handicap. The Forest Department organizes theoretical and practical courses for the subordinate staff every year.

A Forest Research Institute was established in 1939, attached to the Forest Department, and is directed by the Conservator of Forests. It is located at Ilanoth and has three sections dealing with ecology and silviculture, forest protection, and wood technology. The Institute has well-equipped laboratories and looks after many experiment plots throughout the country. There is also an aboretum of 80 dönüms[2] at Ilanoth, attached to the Institute.

This institute cannot cover all aspects of forest management and wood economy in the country, and the

[1] An FAO adviser visited the country for 3 months in 1953 to review and give guidance on the general forestry program.

[2] 1 dönüm = 0.22 acre, 0.089 ha.

problems studied during the three years of its existence are summarized below. There are obviously many other problems which deserve attention and it is hoped that the Institute's activities will continue to expand.

Forest Research Program: Considering the emphasis placed on afforestation in recent years, it is natural that special attention should have been given to the problems connected with the establishment of new forests. The exclusive use of seed from selected seed trees of the principal species was introduced to improve the quality of future stands. Much research has also been done on different aspects of nursery operations; methods of seed pre-treatment have been studied and research done on the periodicity of germination of different species. Different sowing methods have been tried and new procedures for protecting seed from fungi and rodents have been devised. Studies have also been made to ascertain the best season for sowing and for transplanting the seedlings and on the influence of the soil on plant growth.

Other work has concerned afforestation techniques, in particular, hole and terrace planting. Comparative experiments with direct seeding and planting of seedlings and transplants have been made.

The choice of species for afforesting or reforesting different sites is obviously of cardinal importance. To this end experimental plots have been established to test various newly-introduced species and to compare their growth with that of species previously utilized. In addition, research is being undertaken on the ecology of the principal species. Of the factors investigated, attention has been particularly given to the water requirements of plants (resistance to drought, transpiration), and their soil requirements.

Silvicultural questions are also being dealt with by the Institute. Studies on pruning are in progress and experimental plots for ascertaining the effects of selective thinning have been established.

The activities of the Institute also include research on the possibility of planting trees in Wadi el 'Araba. After a preliminary study of the ecology of the indigenous plants in collaboration with the Botany Department of the Hebrew University, the Institute has worked out methods for sowing and transplanting trees in the Wadi el 'Araba. An experimental nursery is maintained in Ein Hosub. A pedological and ecological study has just been made of the most common type of soil, the hammada. Experimental plots have been laid out to improve planting techniques and to determine species likely to prove adaptable to the environment. Resistance to salt and drought and the transpiration of the chief woody species are being investigated.

In regard to forest protection, the Research Institute is making an inventory of all forest insects and timber pests. Special studies have been made on the biology of *Matsococcus*, chief pest of the Aleppo pine, its parasites and biological control with *Chrysopa* spp. Studies on the biology of *Phorocantha* and *Lyctus*, pests of eucalyptus wood, are also in hand; poles have been impregnated with zinc chloride so as to protect the wood from insect and fungus attack. Chemical control of the pine processionary moth has also been worked out.

Forest Products Research Program: Preliminary studies have been made in the field of wood technology and utilization on the identification and anatomy of native woody plants. The use of indigenous and exotic woods like the pines and eucalyptus is being studied, and research bears on not only their various possible end-uses but also on their physical and mechanical properties and on proper seasoning. In addition, work is under way on pine resin tapping and charcoal manufacture. Since a rational utilization of wood demands adequate knowledge of what can be grown, a study of the productive capacity and the quantities of wood available in the forests is also being made.

Hope for the future

A flourishing Forestry Society of Israel comprises foresters and forest-lovers; it publishes a regular journal and organizes excursions and lectures. According to an old tradition, the people each year celebrate Arbor Day when it is the custom for everyone, young and old, to plant trees.

Altogether, despite the political, economic and social difficulties which confront the young State of Israel, the forest economy appears to be going ahead vigorously.

International Union of Forest Research Organizations

Some 150 delegates from 22 countries attended the 11th Congress of the Union, organized at Rome by the Government of Italy in co-operation with FAO in September last.

The background papers and records of the scientific discussions on the topics selected for discussion by the Congress are being printed and made generally available. The volume of proceedings will contain a wealth of valuable information on the latest ideas and findings in forest research.

After the business meetings at Rome had concluded, a very interesting study tour to Sicily was arranged for the delegates.

The International Council of the Union, which is the supreme body on organizational matters, elected A. Pavari (Italy) as President of the Union on the retirement of H. Burger (Switzerland). H. Van Vloten (Netherlands) was elected Vice-President. Elections to the Permanent Committee which meets annually to direct the affairs of the Union were as follows: C. F. Korstian (U.S.A.), M. Kreutzinger (Poland), J. MacDonald (U. K.), A. Oudin (France), C. R. Ranganathan (India) and L. Tortorelli (Argentina). The following Section Leaders were re-elected or newly appointed for the period until the next Congress which will, on the invitation of the delegate of the United Kingdom, be organized in England probably in 1956: *Bibliography*, E. Saari (Finland); *Forest Influences*, H. G. Champion (U. K.); *Site Factors*, A. de Philippis (Italy); *Forest Plants*, C. Syrach Larsen (Denmark); *Silviculture*, H. Leibundgut (Switzerland); *Protection*, H. Van Vloten (Netherlands); *Forest Management*, Y. Ilvessalo (Finland); *Forest Economics*, J. Speer (Germany); *Operational Efficiency*, U. Sundberg (Sweden); *Mechanical Conversion*, J. Campredon (France); *Chemical Conversion*, H. Mark (U.S.A.).

Under a special agreement between FAO and the Union, the Union collaborates closely with FAO on matters of forest research. In return, FAO provides secretariat staff and certain services for the Union.

Forest Research In East Africa

by A. L. Griffith,

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British East Africa consists of the three mainland territories of Uganda, Kenya and Tanganyika and the group of islands called the Zanzibar Protectorate, off the coast in the Indian Ocean. It is roughly 1,500 miles (2,400 km.) from north to south and 1,000 miles (1,600 km.) from east to west, and varies in elevation from the sea coast up to Mount Kilimanjaro 20,000 feet (6,000 m.). The main inland feature is the Rift Valley with its series of lakes, the biggest of which is Lake Victoria, some 200 miles (320 km.) from east to west and 250 miles (400 km.) from north to south.

Such a country has a great diversity of vegetation, from the coastal mangroves to the giant lobelias, heather and groundsel of the alpine regions of the volcanoes which give place to vegetationless screes as the snow line is approached. Apart from this altitudinal change of vegetation, inland the forests range from the desert of the northern frontier to the rain forest of Uganda, with its *Khaya* spp., *Entandrophragma* spp., and *Cynometra* sp. Mention must also be made of the vast areas of miombo (a *Brachystegia-Isoberlinia* complex with many forms) which cover much of Tanganyika and which continue for long distances into Northern Rhodesia to the south.

A great feature of East African forestry is the raising of plantations of exotic softwoods such as pines and cypresses in the highlands of all three of the mainland territories. East Africa possesses only two indigenous softwoods, *Podocarpus* spp. and the pencil cedar *Juniperus procera*. These two species have been largely cut out and although comparatively easy to raise in plantations, they are slow growing and take some 150 years to reach millable size – 24 inch (60 cm.) diameter. Hence the emphasis on growing exotic pines and cypresses which produce a similar product of a similar size in some 30 to 40 years.

From this description of East Africa and its vegetation, it is obvious that to cope with forestry research under such very varied conditions needs a flexible organization and this is found in the East African Agriculture and Forestry Research Organization (EAAFRO). It is situated at Muguga which is some 15 miles (24 km.) outside Nairobi in Kenya. The organization is still in process of development and consists of some 35 research officers and scientific assistants, together with administrative and clerical staff. The subjects covered include soil chemistry, spectography, soil surveys, plant physiology, systematic botany, plant breeding, entomology, cytology, mycology, forest ecology, statistics, horticulture, etc. The basic principle is that the staff shall not work in watertight compartments, but shall be drawn upon as a team to work on any particular subject whether it be connected with agriculture, forestry or animal husbandry. Several colonial development and welfare schemes are based on EAAFRO.

A research organization which dealt chiefly with agriculture was originally founded by the Germans at Amani in Tanganyika in the first years of this century. It was restarted about 1920 as the East African Agriculture Research Organization, and in 1948 was reorganized and moved to its present headquarters. Forestry was added in 1950, and animal husbandry in 1952.

The reason that there is one research organization for all the territories is that most of the problems are inter-territorial, and it is therefore not necessary for each territory to go to the expense of having its own research staff. Examples of such inter-territorial problems are the softwood schemes of all three mainland territories; the mangroves of Kenya, Tanganyika and Zanzibar; and the mvule (*Chlorophora excelsa*) and the regeneration of the hardwoods of all three territories.

There are many problems which require to be studied, but the most urgent, which are being worked out at present, are:

1. information, its collection and distribution;
2. standardization of research procedure;
3. softwoods;
4. enumerations;
5. regeneration of hardwoods;
6. short-term tree cropping;
7. yield tables for important species.

In addition, insect and fungal problems are being studied by the appropriate staff, but these chiefly relate to softwoods.

Information

It was soon apparent that much technical information existed in the territories, but that it was usually scattered and difficult to find. A forest bureau was established within EAAFRO to collect and file all available incoming information. Information is dispersed as well: a number of publications such as an East African forest bibliography and a silviculture of East African trees are in preparation. One of the main reasons for the urgent necessity for such publications is that, owing to the war and postwar development, most of the forest departments consist of young officers, and technical books on tropical forestry are scarce, so that these young officers have great difficulty in obtaining instruction in silviculture quickly.

Standardization of research procedure

This had to be done as most of the territorial research officers were new to the work, and in order that the work of one territory should be immediately intelligible to another territory. It has largely been achieved by adopting the Indian Silvicultural Research Code as a general basis together with the standard forms for recording research data. This tends to minimize the recording of superfluous data while at the same time preventing the neglect of necessary information.

Softwoods

This is one of the main subjects being studied and includes seed and nursery problems, short and long term planting-out problems, and the trials of further exotics. Apart from the normal plantation difficulties of pruning, thinning, etc., there are two main softwood problems: the main groups of exotics, the gums, the cypresses, the pines and the wattles are all hybridizing among themselves; and secondly there is the question of disease susceptibility to both insects and fungi. Nursery problems are largely those of producing bigger and better plants more quickly, for, if a seedling has to remain in the nursery for two years instead of one year, its cost of production is greater. One nursery problem is that the soils of the nurseries over the three territories are so variable — from volcanic dust to heavy black cotton clay. Again, many of the exotics also require mycorrhizae and these are not introduced with the seed. Experiments are in progress on altering the seedbed soil structure, the addition of fertilizers and the cultivation of mycorrhizae. Further, there is no certainty yet that the best species or the best strains of the best species have been introduced. To test this an arboretum of small plantations (not of individual trees) is being established. Already it contains some 78 species.

Enumerations

Many forests in East Africa are being fairly heavily worked and, in consequence, much time and money is being spent on enumerations or inventories. Research on this subject is being carried out to try and find the most suitable, economical and efficient methods for stocktaking in the forests. Enumeration work is expensive both in time and staff, but it is essential to know what is in a forest if it is to be worked and developed.

Regeneration of hardwoods

The hardwood forests are being exploited and, in general, regeneration is not satisfactory by either natural or artificial means. Experiments have been initiated, but owing to the distribution of these hardwood forests the work must largely be done by the territories themselves with EAAFRO advising and co-ordinating.

Short-term tree cropping

A lot of work with exotics consists of short-term tree-cropping over rotations of 6 to 12 years with species such as wattle for bark and gums for fuel. This practice is alleged to exhaust the soil and lead to progressive deterioration in yield. Investigations have been started to determine whether the decrease in yield is due to stool mortality and stool deterioration (as was found to be the case in Southern India with the blue gum *Eucalyptus globulus*) or whether it is due to a genuine deterioration of the soil.

Yield tables for important species

There is little or no information on tree crop growth in East Africa except for that of an exotic *Cupressus macrocarpa*. Information is being collected, but this is a long-term project.

It will be appreciated that, although forestry research in East Africa has made a comprehensive start, it will be many years before work can get abreast of the problems that exist today, and no doubt each year will see new problems arising. One of the most encouraging features of the work so far undertaken is the complete co-operation between the four territories. Forestry research in East Africa is indeed being tackled as a combined operation.

Commodity Report

Pulpwood and Pitprop Supplies

The rising demand for wood products in all forms during 1951 affected sales of small-sized industrial roundwood. The world's pulp industries were looking for increasing supplies of pulpwood, and at the same time the demand for pitprops was high because of a general rise in the world's coal production. The simultaneous heavy demands from the pulp industries and the coal mines tended to unbalance the market in regions where international trade was important in furnishing supplies. This was particularly true in Europe; in other regions which are generally less dependent on international trade the fluctuations in demand for both pulpwood and pitprops could more easily be borne.

The number of potential exporters of roundwood in Europe is limited, and heavy demand in 1951 resulted in a rush for available supplies and consequently in a considerable rise in the prices of pulpwood and pitprops. In 1952, the situation improved as the demand for wood pulp and pulp products declined and the pulp industries withdrew from the international market as pulpwood buyers. The coal mines were free to build up their supplies and at the end of 1952 supplies of roundwood for both pulp industries and coal mines were generally considered to be satisfactory.

The volume of output and the trade in pulpwood and pitprops have fluctuated considerably in the course of the past three years with the rate of consumption. Total world production of pulpwood which was 126.6 million m^3 in 1950, rose in 1951 to an all-time high of 148.7 million m^3, but declined to 144.7 million m^3 in 1952. World production of pitprops which was 34.7 million m^3 in 1950, rose to 37.3 million m^3 in 1951 and to 38.7 million m^3 in 1952. The regional distribution of world production in these two categories is given in Table 1.

While the rate of consumption of pulpwood is closely tied to that of wood pulp production, the trend in the consumption of pitprops has not moved in relation to coal production. In spite of increased coal output in the world the consumption of pitprops has remained fairly stable and even fallen slightly in some regions. This has been mainly due to two factors, both prompted by the rise of pitprop prices–efforts to reduce the number of pitprops used in coal production and increased recovery of used pitprops. The structure of the coal mines in North America, which allows easier exploitation, explains in part the low utilization of pitprops compared with the volume of coal produced, but the great technical progress and mechanization in these mines is also a contributory factor.

A detailed analysis of the market conditions for pulpwood and pitprops is of general interest only in relation to developments in Europe, because the structure of the European roundwood market is by far the most complicated and most easily influenced by fluctuations in demand. Nearly all European countries depend to a great extent on international trade for their small-sized roundwood requirements; elsewhere, countries can provide locally almost all of their needs or, as in the case of North America, there is an important and traditional roundwood trade between two countries only.

Europe

The recent fluctuations on the European market for pulpwood and pitprops have their origin in the strongly increased demand for wood pulp and pulp products in 1950-1951. At the time when the pulp mills started to feel this pressure, stocks of pulpwood

Table 1. — World Production of Pulpwood and Pitprops [1]
(in millions of cubic meters [r])

Region	Pulpwood			Pitprops			Total		
	1952	1951	1950	1952	1951	1950	1952	1951	1950
Northern Europe [2]	25.3	28.5	24.9	1.9	1.8	1.2	27.2	30.3	26.1
Eastern Europe [3 4]	7.0	6.8	6.4	4.0	3.9	3.8	11.0	10.7	10.2
Central and Western Europe	6.4	6.0	4.9	9.9	9.0	8.9	16.3	15.0	13.8
Total for Europe	38.7	41.3	36.2	15.8	14.7	13.9	54.5	56.0	50.1
Soviet Union [4]	8.5	8.0	7.5	13.0	13.0	12.5	21.5	21.0	20.0
North America	91.4	93.9	78.6	4.1	4.0	3.5	95.5	97.9	82.1
Latin America	0.8	0.6	0.6	0.5	0.5	0.5	1.3	1.1	1.1
Africa	–	–	–	1.3	1.2	1.2	1.3	1.2	1.2
Asia	4.8	4.4	3.2	3.8	3.7	2.9	8.6	8.1	6.1
Pacific Area	0.5	0.5	0.5	0.2	0.2	0.2	0.7	0.7	0.7
World Total	144.7	148.7	126.6	38.7	37.3	34.7	183.4	186.0	161.3

[1] Compiled by the FAO staff on the basis of official and semi-official figures. — [2] Finland, Norway, Sweden. — [3] Eastern Germany, Poland, Czechoslovakia, Hungary, Romania, Bulgaria. — [4] Asiatic and partial figures for 1950, 1951 and 1952 computed on the basis of available information.

with most of the European pulp industries were already rather low, and were soon dangerously reduced. Thus before the beginning of 1951 there was an urgent call for new pulpwood supplies. The number of potential pulpwood-exporting countries in Europe being limited (only about 20 percent of European exports in 1951-52 came from sources other than Finland) the competition for supplies became keen. The available supplies at that time could not easily satisfy immediate needs, and prices started to rise.

This sharp upward trend in pulpwood prices stimulated production in both exporting and importing countries and resulted in a considerable increase in the volume of output. Both pulpwood output and trade reached postwar record figures. Particularly interesting was the unusually large volume of imports of pulpwood by Norway and Sweden, both normally self-supporting and even to some extent pulpwood-exporting countries.

TABLE 2. — EUROPEAN EXPORTS OF PULPWOOD AND PITPROPS

(in thousands of cubic meters)

	Pulpwood			Pitprops		
	1952	1951	1950	1952	1951	1950
Austria	—	—	—	308	66	95
Finland	2 631	3 478	1 882	1 653	1 122	880
Sweden	183	169	255	1 000	317	242
Poland [1]	149	155	102	134	3	216
Yugoslavia	397	396	446	4	22	114
U.S.S.R. [1]	7	1	44	301	276	213
Other countries	143	87	185	750	812	731
Total for Europe	3 510	4 286	2 914	4 150	2 618	2 491
Canada [2]	739	763	93	969	219	45
GRAND TOTAL	4 249	5 049	3 007	5 119	2 837	2 536

[1] Eastern European exports as reported by Western European importing countries.
[2] Exports to Europe only.

TABLE 3. — EUROPEAN IMPORTS OF PULPWOOD AND PITPROPS

(in thousands of cubic meters)

	Pulpwood			Pitprops		
	1952	1951	1950	1952	1951	1950
Belgium - Luxemburg	144	184	219	378	372	199
France	571	523	161	354	140	300
Western Germany	1 186	1 253	638	900	58	112
Italy	658	434	355	5	10	6
Netherlands	274	438	235	205	105	61
Norway	399	648	217	—	—	—
Sweden	781	745	490	—	—	—
Switzerland	354	407	34	—	—	—
United Kingdom	464	313	238	3 049	1 785	1 560
U.S.S.R. [1]	298	283	188			
Other countries	159	222	112	28	42	42
Total for Europe	5 288	5 450	2 887	4 919	2 512	2 280

[1] Eastern European imports as reported by Western European exporting countries.

The U.S.S.R. continued absent from the export market throughout 1952, while the volume of its pulpwood imports showed a further rise (Tables 2 and 3). Stocks at pulp mills were rapidly increased to meet the anticipated needs of mounting wood pulp production

During the latter half of 1951 the demand for pulp products slackened and this was transmitted back to the pulp mills, leading to a fall in wood pulp production during the first half of 1952; in some countries this was quite substantial. At the same time fresh supplies of earlier-contracted pulpwood continued to arrive at the mills, which soon possessed stocks considerably in excess of their normal current requirements. As a result, the European pulpwood market in 1952 was relatively quiet and very few new contracts were made. As the supplies at the mills in 1952 had been purchased at record prices, the pulp industries were not too eager to add to their stocks even when prices fell sharply but preferred to wait as long as possible before entering into new contracts.

The year 1953 began with the bulk of the pulp industries continuing to withhold from fresh contracts and it was not until late summer that the first important contracts were negotiated between buyers and sellers. The production of pulpwood in Europe, therefore, has shown a sharp fall in 1952/53.

European pitprop supplies appeared seriously menaced by the booming demand for pulpwood in 1951. At first, coal mines were unwilling to pay prices corresponding to the high pulpwood prices and withheld from any major purchasing. When they finally had to accept the existing price levels, they found great difficulty in obtaining sufficient quantities of pitprops and the supply situation rapidly deteriorated. The continuously high rate of coal production had forced stocks to dangerously low levels by the spring of 1952, but it was at this time — the demand for pulpwood being almost non-existent — that a large-scale purchasing of pitprops was indicated. The coal mines went ahead with heavy purchasing from the main exporting countries and, with a considerable rise in the coal-producing countries' domestic production of pitprops, the situation rapidly improved. In fact, at the end of 1952, the coal mines were in an unusually favorable stock position, and in many countries stocks showed record figures. During the first half of 1953, therefore, the coal mines abstained from any considerable new buying, and the pitprop market in general, like the pulpwood market, was very quiet. Some new major activity was noticeable only towards the autumn of 1953.

As prices of both pulpwood and pitprops at the end of the summer of 1953 were at a relatively low level, producers in the main exporting countries were not, in general, too eager to raise their output from the low level of 1952/53. The forest owners in those countries, having previously sold large quantities at top prices, were little willing to conclude important contracts at the prevailing low prices. Once more, therefore, it seemed that sufficient quantities of pulpwood and pitprops might not be readily available to meet fully the requirements of 1954. Only if the coal mines and pulp industries resisted the temptation to rush with their purchasing and to throw sudden excessive demands on to the market would it be possible to avoid the 1950-1951 experiences, which in the long run proved to be harmful to both sellers and buyers.

North America

The market in North America for small-sized industrial roundwood bears overwhelmingly on pulpwood, since pitprops represent only some 4 percent of the total output of this category. In spite of the region's great production of coal, the total consumption of pitprops is low and is wholly met by local production.

The structure of the North American pulpwood market is very different from the European one. Only about 10 percent of the pulpwood requirements of the United States' pulp industries are imported, and these imports from Canada are regular and well established. The Canadian pulp industries cover the greater part of their pulpwood requirements, or some 64 percent, with the production from forests owned or leased by them; the rest is purchased from farmers and private forest owners. The Canadian pulp industry does not, therefore, normally experience supply difficulties, and, as the United States is by far the most important buyer of Canadian export-pulpwood, exporters only have to follow developments in one importing country and have no great trouble in adjusting their production to changes in U.S. demand.

As to pulpwood supplies in the United States, an interesting development is taking place in the extraordinary growth of pulpwood production in the southern states, where the pulp industry is also rapidly expanding.

Table 4. — United States Production and Consumption of Pulpwood
(in millions of cubic meters)

	1952	1951	1950	1949	1948	1945
Southern states ..	29.6	28.4	25.5	20.0	22.1	15.8
Other states	25.7	27.1	20.3	18.9	22.2	18.0
Total production	55.3	55.5	45.8	38.9	44.3	33.8
Consumption by U. S. pulp mills	58.5	58.6	52.2	44.1	46.8	37.4

The above Table also shows that the declining world market for wood pulp and pulp products in 1952 did not perceptibly affect U. S. domestic production of pulpwood. It may, however, have resulted in some decline in pulpwood production in 1953, since pulpwood inventories at mills at the end of 1952 were exceptionally high.

Table 5. — Pulpwood Stocks at U.S. Pulp Mills at the End of Each Year
(in millions of cubic meters)

1952	1951	1950	1949	1948	1945
13.1	11.2	8.4	10.8	12.4	5.8

The holding of large stocks was the main reason why some of the pulp mills slackened their procurement programs for their pulpwood logging activities in the winter of 1952/53, notably in the northeast and in the Lake States. But even so it was reported that mills were doing everything possible to maintain amicable relations with their normal pulpwood suppliers, especially small operators and farmers, in order to ensure adequate supplies of pulpwood in future years.

While U. S. pulpwood production and consumption appears to have been hardly affected by the decline on the market in 1952, in Canada both production and consumption of pulpwood fell noticeably.

Table 6. — Production and Consumption of Pulpwood in Canada
(in millions of cubic meters)

	1952	1951	1950	1949	1948	1945
Production	36.1	38.4	32.8	30.2	31.7	23.2
Apparent consumption	29.8	31.2	28.3	26.1	26.0	19.0

Other Regions

Of the other regions, Asia is the most important producer and consumer of pulpwood and pitprops. With steadily rising production of wood pulp and coal, Japan's needs of small-sized industrial roundwood have shown a relatively steeper increase than any other country. Owing to the steady overcutting of Japanese forests the country has experienced growing difficulty in obtaining small-sized roundwood in sufficient quantities. Trade drawbacks, both with regard to currencies and long distances, have so far made any large-scale import of pulpwood and pitprops an unrealistic solution to the problem. Hence one reason for Japan's interest in securing wood pulp in Alaska and elsewhere. But both coal mines and pulp mills have been able to procure enough roundwood to keep going and even to raise the level of output. The utilization of pitprops in Japan has risen from about 3 million m^3 in 1950 to 3.4 million m^3 in 1951, and was assumed to be about the same in 1952. The consumption of pulpwood showed a steeper rise: about 3 million m^3 in 1950, 4.2 million m^3 in 1951 and some 4.5 million m^3 in 1952.

As to Latin America, Africa and the Pacific area, the requirements of small-sized industrial roundwood have not been great. Although they have risen perceptibly in the course of the past years, they are still easy to meet and no particular difficulties have so far been reported in the pulpwood and pitprop supply situation.

Prices

An analysis of the development of pulpwood and pitprop prices in 1950 to 1953 must bear chiefly on Europe, where fluctuations have been most marked. As has been seen, the rush for pulpwood in Europe towards the end of 1950 led to a considerable rise in prices of both pulpwood and pitprops, which continued until the latter half of 1951. While the rise chiefly concerned export and import prices, it also to some extent affected domestic prices in all European countries. Towards the end of 1951 there was a steep decline in export and import prices which continued throughout 1952, after which domestic prices remained relatively stable. The previously low level of roundwood prices in the main importing countries seems to have been

TABLE 7. — AVERAGE OR APPROXIMATE PULPWOOD AND PITPROP PRICES, 1948-1953
(in U.S. dollars per stere)

	1953		1952		1951			1950	1949	1948
	Aug.	Feb.	June	Jan.	Nov.	June	Jan.	Year	Year	Year
					Export prices					
Northern European countries: f. o. b.										
Pulpwood, spruce halfbarked	9–9½	9½–10½	12½–14	17–18	19½	16	10½	7	8½–10	12–14
Pitprops	8½–9	9½–10	12½–13½	17	18½	16	9	6–7	6½–8	9–10
					Domestic prices					
France:										
Pulpwood [1]	11	11	11½		11½			4½	4	4½
Pitprops [2]	19	10	10		10½			5	5	5½
Western Germany:										
Pulpwood [3]	..	12	12½		9			6		
Pitprops [4]	..	11	12		8½			5		
Switzerland:										
Pulpwood [5]	13	13	13		11½			10	10½	11

[1] Price at the point of departure, excluding taxes, controlled price. — [2] Props of first category, price at the point of departure, controlled price. — [3] Average price in State forests, in Bavaria, spruce, unbarked, hauled. — [4] Average price in State forests, in Bavaria, spruce, under 15 cm. thick long pitprops, barked, unhauled. — [5] Average purchase price, pulpwood first class, spruce, barked, free on wagon at a station of normal gauge railway.

one of the factors allowing these countries to pay unusually high prices for imported roundwood, particularly with regard to pulpwood. In 1952, however, this possibility of compensation no longer existed, because domestic prices rose rapidly and the difference between the prices grew smaller.

In the main exporting countries, on the other hand, stumpage prices had not in general risen as steeply as export prices, and when the latter fell in 1952 forest owners showed some reluctance to sell their roundwood at prices corresponding to those prevailing for export. Hence there were new difficulties in procuring sufficient roundwood to meet both domestic requirements and export demand.

At the time of writing this report the situation has not noticeably changed, and the prospects for European import requirements for 1954 depend, first, on the willingness of the main European exporting countries to accept the present price level; second, on the ability of these countries to produce sufficient quantities early enough to be shipped during the course of 1954; and third, on export availabilities from other sources of supply. It seems that a reduction in Europe's stocks of small-sized industrial roundwood towards the end of 1954 cannot be avoided if the rate of consumption does not decline and industries maintain their activity at least at the 1953 level.

Interesting studies can be made of price relations between pulpwood and pitprops. In general, it should be noted that pulpwood prices have been the leading element, followed by pitprop prices; in some countries local competition for these two categories of roundwood has sometimes reversed the roles. In regard to prices of small-sized industrial roundwood and sawlogs, there is little doubt that the extraordinary demand for and rise in prices of the former were important factors in drawing sawlog prices up, and consequently those of sawn wood also.

The development of average European prices of pulpwood and pitprops is shown in Table 7.

CONCLUSION

Pulpwood and pitprop supplies are a problem only in Europe. The European pulp industries and coal mines have already experienced periods of difficulty in procuring their roundwood, and these difficulties are likely to increase if the capacity and output of those industries in the consuming importing countries rise. For instance, the growing importance of pitprops and pulpwood in relation to Europe's total production of industrial wood and all roundwood is shown in the Table below:

TABLE 8. — PERCENTAGE OF PULPWOOD AND PITPROPS TO TOTAL INDUSTRIAL WOOD AND ROUNDWOOD PRODUCTION

Year	Total production of industrial wood	Total production of roundwood
1949	25.7	14.3
1950	30.3	17.0
1951	37.1	23.5
1952	39.7	25.1

The problem is treated in detail in the recent study on *European Timber Trends and Prospects* published jointly by FAO and the Economic Commission for Europe, which argues that unless a reasonable and effective forest policy, a " dynamic forest policy ", is adopted, Europe may have to face serious difficulties in procuring its roundwood during the coming years.

The Work of FAO

European Forestry Commission and ECE Timber Committee

Last October a series of meetings among European foresters and timber experts were held in Rome. There was a meeting of the Timber Committee of the United Nations Economic Commission for Europe, for which ECE and FAO provided a joint staff; the sixth session of FAO's European Forestry Commission; and a joint meeting of the two bodies.

Membership of ECE differs somewhat from that of FAO and the joint meeting resulted in representatives from 23 countries being present, including Albania, Austria, Belgium, Canada, Czechoslovakia, Denmark, Finland, France, Germany (Federal Republic), Italy, Ireland, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, United Kingdom, United States of America, Union of Soviet Socialist Republics, and Yugoslavia.

Joint Meeting

The meeting was opened with statements by the Director-General of FAO, Norris E. Dodd, and Gunnar Myrdal, the Executive Secretary of ECE. Thereafter, under the effective chairmanship of M. du Vignaux (France) the delegates gave thorough consideration to the report of the working party of experts which had met in the summer of this year to draw conclusions from the study, *European Timber Trends and Prospects*, and put forward recommendations for the consideration of the two parent bodies.

Representatives at the meeting concluded that, since it was the deliberate policy of all European governments to make the fullest use of natural resources in order to achieve the highest living standards for its peoples, it was desirable to maintain timber in the important role that it had traditionally played in Europe's economy. As a short-term policy, this involved increasing forest output through a variety of measures, many of which were already being applied in different countries, and increasing imports of soft sawn wood from the Soviet Union and other regions. In the long run, it meant extending afforestation and improving forest management in order to provide against the anticipated long-term increases in consumption.

The following recommendations were addressed to governments of European countries, to the Executive Secretary of ECE or to the Director-General of FAO.

National felling estimates and actual cut

National felling estimates and actual cut should be kept under review by the United Nations bodies and governments were requested to submit annual figures.

European countries should re-examine their working plans and national felling estimates and explore the possibility of increasing fellings by the various methods suggested in the study, taking into account the probability of a modification in the relative needs by industry for wood of various dimensions. Increasing fellings must be envisaged within the framework of effective silviculture.

While recognizing that the end desired might be attained by different means in different countries and even in separate forest areas, attention was drawn to the enormous possibilities offered in this respect by systematic thinnings in forests where for various reasons, intensive silviculture had not as yet been practised.

National forest inventories

Accurate national estimates of annual cut were necessary and it was desirable to collate such estimates for all countries of Europe. This called for bringing national forest inventories up to date at suitable intervals. Satisfaction was expressed with the measures taken in certain countries to overcome the obstacles recognized as being inherent in making nation-wide inventories. The Soviet delegate described the methods used in the U.S.S.R. in which maximum use is made of aerial photography. The date of 1 January 1957 was set as that by which all European countries should have made available the results of national inventories completed since 1947.

Afforestation and reforestation

Present plans in Europe were still 32-35 percent short of the desirable goals suggested in the study while there appeared to be still 8 million hectares of idle land not covered by any plan. In many instances it was lack of adequate financing that impeded the realization of a valuable project on a sufficient scale or slowed down progress. Governments were asked to make every effort to expand to the maximum their programs for afforestation, reforestation and forest improvement.

Intensive silviculture

Possibilities for increasing forest yields lay largely in the application to forests of knowledge already gained from research rather than in the development of new research. Forest services should be expanded and provided with adequate funds for investments in projects promoting timber production and incidentally likely to afford protective influences. Governments were asked to promote the development and improvement of transportation, especially in mountainous regions.

Technical improvements

There were many other ways of increasing forest yields and on a number of these an exchange of ideas had already taken place in various committees or working parties of FAO, ECE, and OEEC (Organization for European Economic Co-operation). Some matters were of interest to the International Union of Forest Research Organizations. Each agency should pursue work in its own proper sphere and avoid overlapping. Particular attention should be devoted to studies aimed at reducing waste in the forest and at ensuring the fuller use of by-products of the wood-using industries. Much could be accomplished in this field in a short space of time.

High priority should also be given to such matters as seed certification and exchange, increased logging efficiency, grading rules, improved quality of sawn wood and other forest products, better wood utilization, and the utilization by industry of types and sizes of wood not hitherto normally used.

Statistics

The timber trends study had revealed once again the inadequacy of existing forestry and timber statistics for international use. The meeting invited the joint FAO/ECE staff to prepare, as soon as practicable, a long-term program for the progressive improvement of statistics. It suggested that a working party of experts should review the series of timber prices collected by the secretariat and decide on a range of European price statistics for regular publication.

Trade

The need for increased imports of sawn timber by Europe was reviewed at the meeting, and the Canadian

statement was noted, that the estimates contained in the study for prospective North American exports were too low and that from 400-500 thousand standards might be made available, should it prove that Europe had need of that amount. Mr. Myrdal announced his intention of convening a further trade consultation in Geneva next spring, and he promised to bear in mind the conclusions of this meeting in the course of his regular contacts with Member Governments.

Further procedure

The members of the joint meeting addressed thanks to the Director-General of FAO and to the Executive Secretary of ECE for having provided the necessary opportunities for joint consideration of policy problems of concern to all those who were connected with the conservation of forests and with the production, conversion, and distribution of forest products. They invited the joint staffs of ECE and FAO to keep the European forestry and timber situation under continuous review and to publish from time to time revised statements and appraisals of the European timber situation. In this connection representatives at the joint meeting expressed appreciation of the work done by the staff in the preparation of the timber trends study and in assembling a unique range of timber statistics, and recorded the view that the study was an indispensable work of reference. The Executive Secretary of ECE and the Director-General of FAO were requested to convene joint working parties as necessary in pursuance of the recommendations made in the report and, if and when needed, to call another joint meeting of the European Timber Committee and the European Forestry Commission in consultation with their respective chairmen and vice-chairmen.

European Forestry Commission

The European Forestry Commission, in separate session under the chairmanship of E. Saari (Finland), first reviewed the annual reports on forest policy received from Member Governments. At the conclusion of the discussions, it was decided that the special topic for report in 1954 should be small forest properties, their management and improvement. Such small forests make up a substantial proportion of the whole forest domain in Europe.

General items

The Commission had for the first time received special reports on the incidence and control of forest fires. Satisfaction was expressed with the developments reported in different countries both in regard to direct control and preventive measures. It appeared that fire, as a forest problem, was receiving proper attention in Europe.

As regards pests and diseases, concern was expressed over the spread of *Endothia parasitica* and *Hyphantria cunea*. However, since the International Chestnut Commission was directly concerned with control of the former and the European Plant Protection Organization was actively engaged in regard to the latter, it was felt that the Commission itself could not profitably recommend any new action.

On the subject of forestry films, the Commission charged the staff with examining how best the distribution and exchange between countries of forestry films could be fostered. It was suggested that the organizing committee for the fourth World Forestry Congress should try to arrange a film festival on that occasion.

The report and publications of the Commission's committee on logging techniques and training of forest workers (see *Unasylva*, Vol. VII, No. 2) was unanimously approved.

Afforestation and reforestation

A special working party met prior to the Commission meeting to review reports on planting programs submitted by European governments. Projects completed outside the forest proper in the countries concerned amounted to 672,000 hectares between 1947 and 1951. Plans envisaged afforestation of nearly 6.5 million hectares over the coming years. One of the real obstacles to making big planting programs effective was that insufficient attention was given to social repercussions. New forests raised many problems affecting in some instances the whole way of rural life and agricultural practices. Progress in one direction could not be made unless there was also provision for progress in other directions — education and amenity facilities, housing, training, and so on. Foresters needed broad vision to make their projects practicable.

ECE Timber Committee

The Timber Committee carried out its periodic review of the European timber market for the current and coming year on the basis of facts and figures supplied by all the principal trading countries. It was the first time the Committee had met elsewhere than at ECE headquarters in Geneva. The discussions were in private under the chairmanship of M. du Vignaux (France). J. O. Söderhjelm (Finland) was vice-chairman.

Sawn softwood outlook

While no marked change in the level of total demand for sawn softwood was expected this coming year, the supplies from European countries available for export in 1954 seemed likely to fall somewhat short of the 1953 figure. European availabilities were estimated to reach 2.25 to 2.6 million, with reduced availabilities from Finland and Sweden because of decreased stocks, likely to be partly made up by increased availabilities in other European exporting countries. Total availabilities from European and overseas sources in 1954 were estimated at between 2.8 and 3.3 million standards, leaving an apparent deficit of 200,000 to 300,000 standards, a figure the Committee considered within the margin of error of the estimates.

Past experience suggested that, in the event of European demand reaching the levels forecast, additional European supplies would be forthcoming to diminish the statistical gap, while imports required from other continents would lie within the range estimated as likely to be available in Canada, the United States and Brazil for export to Europe.

Timber prices

The level of prices during 1953 remained almost unchanged. The delegate of the Soviet Union explained that the reductions in some U.S.S.R. timber export prices in August referred to certain remaining stocks intended for delivery in 1953 and should not be regarded as indicative of the general course of prices.

There was some discussion as to whether the existing price level offered the possibility of enduring stability. Several importing countries expressed concern about the steady advances in the replacement of timber by other materials, notably in the construction and packaging fields. The anxieties (and hesitation) expressed by Western European importers were fully understood by exporting countries, but it was pointed out that in several exporting countries production costs had risen more rapidly than had corresponding export prices and there was no reason to expect that the impending log buying season would result in raw material prices that would permit reductions in the prices of finished goods. Technical improvements both in wood production and wood use should in time contribute to resolving this dilemma.

Pitprops and pulpwood

The pitprop supply situation in 1953 had substantially improved over expectations, and for the year 1954 an apparent surplus of 380,000 cubic meters was indicated. Pulpwood import requirements and export availabilities showed a different situation. The figures presented indicated a rather substantial apparent deficit between import requirements and export availabilities for both 1953 and 1954.

The Timber Committee urged "early progress in placing forward contracts (for pitprops and pulpwood) which experience has shown to stimulate production... It should be borne in mind that the main production of roundwood in the exporting countries is limited to a relatively short period and there is little possibility of a rapid response to sudden changes in demand."

Possible Raw Materials for Pulp in Indonesia

A preliminary survey has been carried out, under the Expanded Technical Assistance Program, of potential raw materials suitable for use in pulp manufacture in Indonesia.
In addition to Pinus merkusii, *another possible species is* Agathis loranthifolia. *The photographs, taken by J. A. von Monroy in West Java, show, below, the cones and leaves of this species, and, left, a plantation about 35 years old.*

Technical Panel on Wood Chemistry

A sixth meeting of the FAO Technical Panel on Wood Chemistry was held at the Swedish Forest Products Laboratory in Stockholm, 27-28 July, with 37 members, special consultants and guests present from 14 countries. The meeting was timed to precede the XIII International Congress of Pure and Applied Chemistry.

This time the main theme of the discussions was wood saccharification, which not only offers a potentially important outlet for using wood waste and inferior material but also can produce valuable by-products such as liquid fuel, plastics and foodstuffs.

The main purpose of the meeting, which was organized and arranged by Professors H. Mark and Erik Hägglund, was to give advice and guidance to FAO on the application of the latest findings of research in this field, and the discussions produced a wide area of agreement on both the potentialities and limitations of wood saccharification and its products.

The following papers were submitted to the meeting as a basis for discussion:

E. Hägglund – The development of wood saccharification by the Rheinau process.

K. Schoenemann – The new Rheinau wood saccharification process.

J. A. Hall – Recent work on wood hydrolysis in the United States.

H. Rockstroh – Technical and economic aspects of the Scholler process.

J. Saward – Saccharification of tropical woods.

G. Centola – Investigations on wood saccharification in Italy.

H. W. Giertz – Saccharification in connection with wood defibrating.

G. Heijkenskjöld – Bakers yeast.

A. J. Wiley, J. M. Holderby, K. W. Fries – Food and feed yeast in the U.S.A.

E. Schmidt – Production and utilization of fodder-yeast in Germany.

S. Norfeldt – Fodder cellulose or wood pulp for feeding farm animals.

J. B. Martin – Research on spent sulphite liquor in agricultural uses.

H. Burström – Sulphite waste liquor as fertilizer in Sweden.

J. A. Hall – Polyhydric alcohols from wood.

The Panel also devoted some time to reviewing progress in wood resin chemistry and chemigroundwood, papers on these topics being submitted by *Emil Ott* and *E.C. Jahn* respectively.

F. C. Palazzo presented a paper on sawdust for synthetic textiles and plastics.

Members of the Panel are nominated by governments; they serve, however, not as governmental spokesmen but as technicians and are free to put forward their personal points of view. Guests at meetings attend, of course, only in their individual capacities as specialist advisers.

The following were present at Stockholm (members of the Technical Panel on Wood Chemistry are marked with an asterisk): *Austria*, A. von Wacek *; *Belgium*, E. Castagne*; *Canada*, G. B. Purves*; *Finland*, O.V.A. Antwuorinen*, B. R. Nybergh*; *France*, J. Savard*; *Germany*, K. Freudenberg*, F. Reiff, H. Rockstroh, E. Schmidt, K. Schoenemann; *Israel*, M. Lewin*; *Italy*, G. Centola*, F.C. Palazzo*; *Netherlands*, J. A. Dunker; *Norway*, Ö. Bryde*; *Sweden*, H. Burström, H. W. Giertz, G. Heijkenskjöld, E. Hägglund*, S. Norfeldt, E. Adler, O. Brauns, K. B. Steenberg; *Switzerland*, F. Conradin, A. F. Frey Wyssling*; *United Kingdom*, R. H Farmer*, L.C.S. Hobbs, G. F. Underhay; *United States*, E. C. Jahn*, H. F. Lewis*, H. Mark*, E. Ott*, W. F. Holzer, J. Pew, E. P. Wiley, L. F. McBurney; *FAO*, E. Moerath.

International Chestnut Commission

Representatives from France, Italy, Portugal, Spain and the United States attended the second session of the International Chestnut Commission and participated in a study tour in Spain and Portugal from 18 to 30 June 1953.

Organized by the Directorate-General of Forests and the Directorate of State Forests, Madrid, and the Directorate-General of Forest Services, Lisbon, the study tour began with a visit to the areas of coppice chestnut around Gerona, in Catalonia, which supply wood for the manufacture of barrel staves. The itinerary next covered the fruit-producing chestnut areas in Biscaya, Santander, Asturias and Galicia. In Galicia, it was seen that direct control methods were having some success in protecting the stands against the ink disease caused by *Phytophthora cambivora*; in other regions, however, the loss of entire areas from this disease had led to the substitution of chestnut by other species such as *Pinus insignis* in Biscaya and *Eucalyptus globulus* in the Santander region. In Portugal, visits were made to the magnificent fruit-bearing chestnut groves in the provinces of Tras-os-Montes and Beiras, where the trees are generally grown in association with agricultural crops.

The participants were able to see instances of successful treatment against ink disease by copper salts (Urquijo method) in both Spain and Portugal, and they visited laboratories where work on the selection of resistant forms is being carried out, for instance the phytopathology station at Corunna and the Biological Mission at Pontevedra, where interesting studies on the vegetative reproduction of chestnut are being made.

The business meetings of the Commission were held at Santander and on the Island of La Toja, Spain, and at Bussaco, Portugal. The closing meeting at Bussaco was attended by Mr. M. Victoria Pires, the Portuguese Under-Secretary of State for Agriculture.

A. Oudin, Inspector-General of Forests, Director of the School of Waters and Forests (Ecole des Eaux et Forêts), Nancy, who is chairman of the Commission, conducted the proceedings, assisted by the vice-chairman, A. Biraghi, Professor of Forest Pathology at the University of Florence. R. G. Fontaine represented the Director of FAO's Forestry Division.

The Commission was able to note that, although the threat of the ink disease and chestnut blight in Europe was still serious, there were some encouraging signs. Some strains of *Castanea sativa* showing a definite degree of resistance to the blight have been discovered, and hybrids resistant to ink disease are being raised successfully in several countries. Work along these lines will be continued.

The Commission also discussed problems arising from the drift of populations away from areas where the chestnut groves can no longer provide a means of livelihood. Rehabilitation plans were recommended for such areas involving in particular concentration of the growing of fruit-producing chestnuts on selected areas where careful cultivation and high-grade production could be assured, and the reallocation of other surplus land now under chestnut to more profitable uses, which might be either agriculture or forestry, according to the local economies.

Research is being carried out at the Plant Pathology Station at Corunna to induce root development from young shoots for vegetative propagation. The shoots are treated with various plant hormones, covered with moss and then placed in plastic envelopes.

Equipment News

Interest in the development of forest utilization and woodworking industries is reflected in the continual demand for information on new equipment. FAO's Forestry Division collects such information and passes it, on request, to Member Governments. Some of the information collected is published here. FAO accepts no responsibility for the claims put forward by manufacturers.

SOIL-POTTA PRESS. — Produces soil-pots of the equivalent cubic content of a 3 in. (7.5 cm.) earthenware plant pot, the size generally used for propagating most types of young plants. The usual compost or soil mixture is used. Compost should be thoroughly moist, but not too wet. It is the right consistency if, when squeezed gently, it retains its shape without exuding moisture. All compost should be put through a ¼ in. (0.6 cm.) mesh riddle before adding moisture. Soil-pots retain their shape when placed in seed trays or on the staging of a greenhouse until the plant is ready for removal to its permanent growing position. In cases where soil-pots are required for seedlings, it is recommended that they be made about 14 days before they are required, and then placed in a greenhouse so that they warm up to the right temperature.

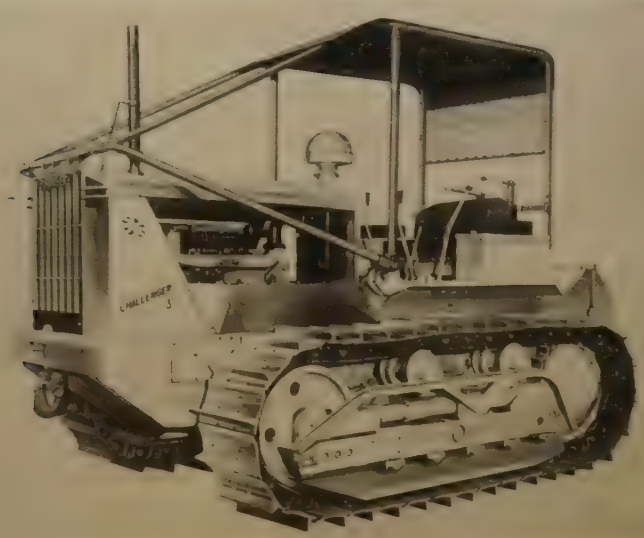
Clico Ltd., Meadow Works, Meadow Street, Sheffield 3, England.

SFI CULTIVATOR. The Forest Research Institute of Sweden has designed the screening implement illustrated. The implement, which has double rippers, has a resistance of about 700 kg. and passes without difficulty over stumps, stones or rough ground. It rips parallel furrows for sowing seeds with a distance between furrows of about 1.7 m. The cultivator works as fast as the tractor advances, the normal time required to cover a hectare of ground being approximately 1.5 hr. according to the ground conditions and the tractor used. The cultivator may be drawn by a crawler tractor of about 2 tons and 30 h.p., or a wheeled tractor of about 3 tons and 40 h.p. *Specifications:* framework of the cultivator is of 4 in. (10 cm.) U-shaped standard iron and the same is used for the rippers. Ripper wheel is of ¼ in. (0.6 cm.) iron plates; the tooth wheels, the center of the front wheel and the coupling are of cast iron and the small excentric tooth wheel of cast steel.

Pahlen and Persson, Upplands, Väsby, Sweden.

LOGGING EQUIPMENT. — Comprehensive set of timber extraction equipment for the "Challenger 3" crawler diesel tractor. *Winch:* direct geared, single speed, reversible logging winch. Line pull with bare drum is 38,500 lb. (17,464 kg.) at 76 ft. (23 m.) per minute, or, with full drum, 38,000 lb. (17,237 kg.) at 100 ft. (30 m.) per minute. Special features include slave winch with independent control gear, which may be fitted as an extra and which forms a complete unit when bolted to the main winch. *Canopy:* canopy of tubular steel is bolted to substantial mountings on the tractor body, shields the driver from falling timber and provides shelter from extreme tropical weather. *Bumper:* for pushing, as in heavy undergrowth, or for moving stalled vehicles, etc. *Guards:* bottom rollers are protected by soil guards bolted to the underneath of the track frame on each side of the bottom rollers. Top rollers and support brackets are similarly protected from logs and brushwood by guards constructed of steel rail. *Hook:* bolted to the front hull is a rigid type towing hook, useful when working in restricted spaces. *Specifications:* dimensions of tractor fitted with logging equipment vary from standard specifications as follows: length (including winch and bumper bar) 15 ft. 6 in. (4.7 m.); height (including tree canopy) soft ground level 9 ft. 5½ in. (2.9 m.); weight, 25,834 lb. (11,718 kg.); ground clearance 12 in. (30 cm.); ground pressure, 6.871 lb. per sq. in. (483 kg. per cm²).

John Fowler and Co. (Leeds) Ltd. Leeds 10, England.



BOUGHTON WINCH. — Winch can be used either for hauling or towing, or in conjunction with timber arch under all conditions: it can be supplied with or without rope of 5/8 in. (1.9 cm.) diameter and 225 ft. (69 m.) long. *Specifications:* line pull up to 16,430 lb. (7,450 kg.); brake, operated by lever close to driver's hand, holds total load when towing up to 9,000 lb. (4,080 kg.); control lever frees rope drum for instant payout of rope. All main components of steel construction. Heavy duty ball bearings, oil bath lubrification. Gross shipment weight 1,300 lb. (590 kg.).

T. T. Boughton and Sons Ltd., Amersham Common, Bucks., England.

"GYRO-84" BRUSH CUTTER. — *Specifications:* rotating hammer-mill type blades, ½ in. thick × 4 in. wide (1.3 × 8 cm.); bevel drive gears; Timken gear box bearings and wheel bearings; drop center rim wheels, 6.00 × 16 in. (40 cm.) or 15 in. (38 cm.); net weight, approximately 1,400 lb. (635 kg.); clearance above ground, up to 14 in. (36 cm.); drawbar of adjustable height; 24 to 45 h.p. tractors recommended; 7/16 in. (1 cm.) diameter safety sheer pin clutch.

Servis Equipment Company, 1000 Singleton Boulevard, Dallas, Texas, U.S.A.

LUMBER ROLLER. — This car door lumber roller is fitted with guide rollers to keep lumber in line, and with rubber ends to prevent slipping on steel door jambs or wood jambs. Guide rollers are vertical to the main roller so that the board need not necessarily be placed straight on the roller. Unit is constructed of two steel tubes, one telescoping inside the other.

Wisconsin Lumber Roller, 117 Frederick Ave., Oshkosh, Wis., U.S.A.

HIGH-SPEED BAND-SAW Bi 600. — Saw is encased in heavy, one-piece cast-iron body; vulcanized rubber bands; built-in air-cooled motor; *Specifications:* wheel diameter, 24 in. (600 mm.); working height, 12 in. (300 mm.); working width, 24 in. (600 mm.); r.p.m. of wheel, 920; motor, 2.5 h.p.; approx. net weight, 960 lb. (400 kg.).

Zuckermann Woodworking Machinery, Anastasius-Grün Gasse 22-24, Vienna 18, Austria.

CARRY-LIFT. — Designed to facilitate log and lumber handling in sawmills. Load rests on the frame, which in turn is mounted on heavy-duty truck-type springs and 4-wheel drive axles. The Carry-Lift travels forward or in reverse up to 30 m.p.h. (48 km. p. h.). *Specifications:* It lifts from below ground level to a height of 14 ft. (4.3 m.); hydraulic steering has optional 2-wheel or 4-wheel steer; 2-wheel steer type has a turning radius of 22 ft. 6 in. (6.9 m.), 4-wheel steer has radius of 14 ft. 3 in. (4.3 m.). Weight, approx. 8 tons; lifting capacity, 10,000 lb. (4,540 kg.) arms retracted, and 6,000 lb. (2,720 kg.) arms extended. Power is provided by an industrial, 6-cylinder, heavy-duty gasoline engine.

Pettibone Mulliken Corporation, 4700 West Division St., Chicago 51, Ill., U.S.A.

News of the World

The items appearing here are condensed selections of news thought to be of interest to readers of UNASYLVA. *They are grouped alphabetically by countries under headings currently used by the Forestry Division for reference purposes. FAO assumes no responsibility for statements in news items accepted in good faith from outside contributors.*

General

CAMEROONS

• Forestry extension work, in the sense of the instruction of the local people in the art of silviculture, is an important part of the routine duties of forest officers in the British dependent territories. It is reported in this connection that on the mountain grasslands of Bamenda, in the Trust Territory of the Cameroons, demonstrations by the Forest Department of eucalyptus growing have been taken up so eagerly by the people that they have quite changed the appearance of the countryside.

CHILE

• In Concepción the descendants of Arturo Junge Sahr who introduced Insignis Pine (*P. radiata*) into Chile, have offered an annual prize of 10,000 pesos to the author of the best thesis on new uses for this species. The object is to encourage research and application of the results of the research. The jury for the award will be formed by one representative of the Society of Chemical Engineers, a representative of the research center to be organized as a result of this campaign, and a member of the Junge family. The Arturo Junge Sahr Prize is being donated by his children, grandchildren and great-grandchildren to honor his memory, and will be awarded annually on 17 October, the date of his birth.

GERMANY

• Dr. Adenauer, the Federal Chancellor of West Germany, together with the Minister for Nutrition, Agriculture and Forestry, Professor Dr. Niklas, participated in the ceremonies at the Green Week Berlin 1953 and the annual meeting of the Schutzgemeinschaft Deutscher Wald (Union for the Protection of German Forests) at the Technical University. The president of Berlin's regional branch of this Union reported on the reconstitution of Berlin's forests, which was planned to be completed in 10-12 years but had proceeded so quickly that, after four years, full success could now be considered as secured.

NIGERIA

• After many vicissitudes, *Farm and Forest*, originally the *Nigerian Forester*, now appears as an annual volume devoted to land use and rural planting in West Africa. The technical articles cover a wide range of subjects, including, in addition to forestry and land use planning, cattle breeding, fishing, agriculture and composting, and the selection is made to emphasize the interrelationships between the several phases of land use. A recent forestry article describes research in the establishment of neem in Bornu Province and indicates the steps that are necessary to establishment of this desirable species in an area with 25 inches (635 mm.) annual rainfall, with an effective wet season of only 3½ months. Cultivation during and at the end of the wet season has a remarkable effect on the health and initial survival. It is important that planted materials should consist of stumped one-year seedlings, nursery raised, since neither stumped wild seedlings nor direct sowing of seed is effective. Good plantations form a closed canopy at 3 years; growth is rapid but thinning is unnecessary and the stand may be cut at 10 years.

UNITED KINGDOM

• At a special ceremony in July, Queen Elizabeth II, the Duke of Edinburgh, and Commonwealth representatives planted a grove of 62 oak trees in the park of Windsor Castle to commemorate Coronation year. The trees were *Quercus petraea*. Throughout the United Kingdom and in many parts of the Commonwealth, trees were also widely planted by individuals, communities and forest services in honor of the Coronation.

• *British Commonwealth Forest Terminology* (Part I: Silviculture, Protection, Mensuration and Management, together with allied subjects) has been published by the Commonwealth Forestry Association as the first part of a forest terminology prepared in consultation with representatives of the forestry profession in all parts of the Commonwealth.

The criterion for inclusion of terms is what a forest officer in the field might want to know. In addition to terms in connection with the branches of forestry covered, a number of terms have been included connected with ecology, soil science, genetics, photogrammetry and statistics, which occur with some frequency in literature necessary for the practising forester. Appendices deal with silvicultural systems, tree classes and thinning grades.

It is hoped to publish in due course two further parts, dealing with (II) Extraction, Utilization and Trade in Forest Products, and (III) Forest Products Research.

UNITED STATES OF AMERICA

• The work of an American consulting forester is described in a recent publication, *Forests for the Future*, the story of sustained yield as told in the diaries and papers of David T. Mason, 1907-1950, with introductory text and notes by R. C. Loehr. It is published by the Forest Products History Foundation, St. Paul, Minnesota.

As a private consultant, Mr. Mason was retained by a number of clients to formulate management plans, estimate timber values for individual companies and to promote co-operation in the lumber industry as a whole through regional and national trade associations. The book describes how Mr. Mason, with almost a crusader's zeal, worked at persuading private industry and public foresters to pool their timber resources to create sustained yield units for the purpose of stabilizing forest communities. The day-to-day steps which were followed to secure the necessary legislation for this purpose are described in detail, although what is cause, what is effect, and what may be mere association is not always made clear.

• A grant of $30,000 has been made by the Rockefeller Foundation, New York City, to the Society of American Foresters to make a study of forestry research in America, specifically to determine the progress which has been made during the past quarter-century, to make an estimate of the present status of programs, and to appraise the needs for the next 25 years. All forms and fields of forestry research will be included, and a committee of qualified men has been appointed to draw up plans, employ personnel, and supervise the study.

Fundamental Science

GERMANY

• A book by F. v. Hornstein, *Wald und Mensch* (Natural forest and mankind), published by Otto Maier Verlag, Ravensburg, is a handsome and artistic volume which undertakes to present the history of the natural forests of the foothills of the Alps in Germany, Austria, and Switzerland in terms of their influence on man and the effect man has had on the forests. The style is an interesting mixture of philosophical discussion and semi-scientific description in the field of forest ecology. The illustrations include some photographs but,

for the most part, consist of reproductions of paintings and ancient maps.

The various sections cover forest history and evolution, landscape, regional forests, primitive exploitation and silvicultural methods, natural forest succession with examples from spruce invasion, primary, secondary, cultural, and tertiary forest types. The book is of considerable interest from the historical and philosophical point of view as background for ideas on forest land use possibilities.

Union of Soviet Socialist Republics

• The plan for "remaking nature" calls, among other things, for the afforestation of more than 300,000 hectares of barren sands, which are continuously shifting with the prevailing winds. No afforestation is possible unless the sands are first stabilized. The usual method is to protect sown seed or planted trees for a number of years until they become fully established by building fences, or putting up screens and coverings of straw or other materials. These devices are cumbersome, time and labor-consuming and prevent the use of mechanized machinery.

In 1935, the Agro-Physical Institute suggested fixing moving sands by spraying with a bituminous emulsion immediately after sowing or planting. As the emulsion reaches the ground it loses its water through evaporation and the remaining particles of the bitumen cement the grains of sand and make them resistant to wind movement. The petroleum bitumen selected, in contrast to other bitumens tested, does not injure the plants. The emulsion is prepared by heating bitumen in a large caldron to a temperature of 130-140°C; into another caldron filled with water is introduced an emulsifier in the form of a sulphate concentrate (residual by-product of paper making) and caustic soda. The contents of both caldrons are conveyed by pipes into an emulsifying machine, from which emerges a 50 percent bituminous emulsion. Application is made at the rate of 2 tons of emulsion (1 ton of bitumen) per hectare. For better penetration into the sand, the emulsion is mixed with water (1 part emulsion to 9 parts water) before spraying.

Until recently, experiments with fixing shifting sands in this way were carried out on a comparatively small scale. In 1951-52, however, the method was applied on a large scale on the desert sands of Kara-Kum (Turkmenistan) and on the shifting sand of the lower Dnieper. In all instances the treatment stopped the movement of the sand; the effects were proved most convincingly in the case of a large sandy area in the lower Dnieper region planted to pine. Half of the area was bituminized, the other half remained untreated. Two days after planting, a severe wind storm occurred. During the storm, the untreated area lost a layer of sand 30-35 centimeters in thickness or 3,000 tons of sand per hectare per day. The bituminized area showed no effect of wind erosion.

Tests made with plantings on steep slopes, exposed to winds coming from all directions, gave similar results, and winter, spring and fall precipitation had little effect on the bituminous film. In Kara-Kum, where strong winds occur very frequently, the film during the entire summer was broken only on 5 to 8 percent of the bituminized area.

Tests were also made to determine the effect of the bituminous covering upon the moisture-absorption capacity of the sand. Where the standard 1 ton of bitumen was used, uniformly distributed, 210 millimeters of precipitation per hour could be absorbed. If the application of bitumen was increased from 1 ton to 2 tons per hectare, the absorptive capacity of the sand markedly decreased. It was found that the rate of evaporation from bituminized and non-treated surfaces during the night or early morning, and on cloudy days, etc., was exactly the same; but on hot or windy days, the evaporation from non-treated sand was nearly twice as great as from treated sand. This explains the generally greater moisture content of the sand under bitumen.

The dark color of the bituminous film also favors the absorption of heat. The sand at a depth of 20 centimeters, where most of the roots of the young plants are found, is therefore slightly warmer under treated surfaces but not sufficiently so to harm the growth of the trees in early spring, this higher temperature under the bitumen cover having a positive advantage. When the air in the soil contains about 0.5 percent of carbon dioxide and 20 percent of oxygen it is considered normal.

The percentage survival of plants seems to have been greater on bituminized sands than on sands mechanically protected from blowing by screens, fences or brush covering. The cost of operations was also in favor of bituminization. Tests showed that the treatment, using a hand pump, required 17.5 man-days per hectare. By using a power pump, the spraying could be done in 6.6 man-days per hectare; in contrast the erection of protective devices required 130 man-days per ha.

The large-scale tests with bituminous emulsion appear to have shown conclusively that shifting sands fixed by this method become densely covered with vegetation and that the sand movement can be completely stopped.

• The All-Russia Institute of Agricultural Microbiology is reported to have succeeded in obtaining a pure culture of the so-called mycorrhizal fungi and in developing a method for their mass propagation. This is of considerable practical importance to the forest planting activities on the steppes and other treeless regions where the fungi are absent. The presence of mycorrhizal fungi in the soil is essential to any successful, forest planting; the general practice was and still is to add, at the time of planting, some forest soil brought from a forested locality. This method is simple and effective, but cumbersome. The use of pure cultures of mycorrhizal fungi does away with this necessity.

The efficiency of the application of the pure culture has been tested at many forest stations throughout the southeastern part of European Russia, chiefly in oak plantations. The acorns, before they have been sown, were sprayed with water containing hyphae of the mycorrhizal fungus. The seedlings subsequently showed a greater accumulation of nitrogen and other elements in the leaves than did seedlings on control plots not treated at all or treated with the addition of forest soil. The seedlings treated with the pure culture had also a larger foliage cover and a more intensive absorption of water. The greatest advantage of all, however, was that one *grain* of liquid pure culture could take the place of several hundreds of *kilograms* of forest soil.

Silviculture

British Guiana

• The Rupununi savannas of British Guiana, which support a range cattle industry, have an average rainfall during the 8-month dry season of 20 inches (500 mm.) and during the 4-month wet season of 40 inches (1,000 mm). Soils are generally sandy and thus are readily leached of plant nutriments. To date there is relatively little serious erosion on the savanna lands. There are several range sites — bush, mountainsides, ironstone hills, white sand, brown sand and swamps and marshy areas — each with its own characteristics and value for grazing. The savannas have deteriorated as a result of misuse of the range. Indiscriminate and persistent burning has destroyed organic material, opened the soil to wind erosion, obliterated many fire-sensitive species including some most valuable as forage, and probably destroys at least three-fourths of the forage grown each year. Burning has been a practice for a long time and will have to be brought under some sort of control if a substantial program of range improvement is to be effective.

Other important measures of improvement include improvement of land tenure which is now such that ranchers are unwilling to make capital improvements in land used by their herds; stabilization and control of the local Amerindian population, at present free to go anywhere and the principal source of fires; betterment of marketing facilities; provi-

sion for financing the required range and ranch improvements; working out methods and programs to correct very severe nutritional deficiencies through addition of mineral salts, particularly on areas used by breeding herds and young animals; better grazing management including the control of area and seasonal use on the ranges; better livestock management practices; control of livestock diseases and parasites — for example, the dipping of stock for control of ticks rather than attempted and ineffective control through range burning, the present practice; improvement in quality of cattle through selective breeding of native stock together with import of animals from other South American countries having broadly similar conditions.

Iraq

• An Australian FAO technical assistance officer reports that it is evident from the widespread planting of single trees for shade or ornament that some species of eucalyptus are particularly suited to the Iraq climate and other conditions. The growth is so good that eucalyptus is an obvious choice for a major part of any afforestation program. About 20 species have been found planted in Iraq — mainly at Rustamiyah, Zaafaraniyah, Habbaniyah and Abu Ghraib. Apart from these localities, however, the planting throughout the country is confined to two species—*E. camaldulensis* (syn. *rostrata*), and *E. microtheca* (sometimes called *E. coolabah*). The growth of these species is very good over wide areas, and finds its limit only with the low temperatures in the north at the Mosul, Arbil, Kirkuk line and on salty soils in the south. Almost all the trees are less than 20 years old, and with few minor exceptions are open-grown. The quality of the timber so far produced is therefore at the best moderate and the form of the stems often inferior. A plantation at Abu Ghraib which has been moderately well established is now about 14 years old. There has been some trial cutting and measurement of yields which is sufficient to show that good forest plantations can easily be successfully created, and it is obvious that with sound forestry technique, much better timber and stem form could be produced. The total volume increment in this plantation expressed as mean annual increment is about 3.6 m^3 per dönüm [1] which is large, and it is clear that not only can this volume be expected generally but that with suitable techniques it can be substantially exceeded. There is therefore enough evidence to be sure of successful results in a eucalyptus afforestation program in Iraq. The degree of success will depend on the skill with which the program is put into effect.

[1] dönüm = 0.22 acre (0.089 ha.)

United States of America

• The School of Forestry, University of Florida, reports that experiments on the effect of colloidal phosphate on the height growth of slash pine plantations showed that small amounts applied in or immediately around the planting hole had no significant effect; heavy applications of from ½ to 2 tons per acre (1.2 to 4.9 tons per ha.) broadcast had highly significant favorable effects; applications of ½ and 1 ton per acre (1.2 and 2.5 tons per ha.) broadcast and disked had marked effects; and applications of ½ ton per acre applied in four-foot (1.2 m.) strips and both disked and undisked, also had marked effects.

• The Institute of Forest Genetics of the California Forest and Range Experiment Station, has developed 23 pine hybrids which are being tested by the station itself and by various other institutions in different countries. The information from these tests has recently been summarized, showing the probable or possible field conditions where the hybrid may be successful, the growth characteristics, susceptibility to insects and disease, and the like. Distribution of hybrid seeds is necessarily restricted to institutions and individuals in areas having probably suitable climatic conditions and who are prepared to conduct tests with acceptable care.

• The State University of Wisconsin, the Wisconsin State Conservation Department and various wood-using industries have supported an investigation of forest tree breeding in Sweden and other European countries, as a basis for recommendations on the progress, financing, aims and methods of the program already under way in Wisconsin.

A catalogue has resulted of the principal lines of work and forest species involved at each of the breeding stations and centers studied, a listing of the principal experts engaged in the work and the specific projects carried out by each, descriptions of vegetative propagation methods developed including methods for grafting spruce and pine, establishing clones of aspen through grafting and rooted cuttings, production of aspen seedlings, grafting oaks, and methods for inducing flowering with various species. Also a grafting timetable for various forest species as developed in Europe. Thus there is now available a handy compilation and critique of significant work under way in Europe which will undoubtedly be useful to American workers.

Union of Soviet Socialist Republics

• In the northern region of European Russia, there are vast stretches of forest land which, because of clear cuttings followed by fires, are bound to become waste land unless artificially regenerated. A test with airplane seeding during 1938-41 on 2,400 ha. of land burned over near Vologda in 1932-36, has recently been reported.

Before seeding from the air was attempted, three methods of soil preparation and ground seeding had been tried,

(*a*) plowing the land and sowing the seed into the furrows or on the soil turned up by the plow, the seed being raked in by hand;

(*b*) harrowing land that had only a sparse ground cover, with and without raking in the seeds;

(*c*) broadcast sowing without any preparation of the ground and without raking in the seed, thus retaining natural conditions. Scots pine, spruce and larch seed was sown by hand at the rate of 1.5 to 2 kg. per ha. and even greater for larch, during early spring in 1937, 1938 and 1939; one sowing made in the fall and another in summer proved unsuccessful. After each sowing counts were made of the number of seedlings that came up under each set of conditions. Sowing in furrows and on the upturned soil resulted in about 10 pine, 10 spruce and 4 larch seedlings per running meter; on harrowed land, pine 42, larch 31, and spruce 4 seedlings for each running meter; the most surprising results were obtained on the soil that had not been worked over at all, namely an average of 82 seedlings per running meter for all 3 species. These results clearly demonstrated that under local conditions unprepared soil provided a favorable bed for the seed and indicated the possibilities of using airplane seeding.

In the early spring of 1940 some 420 ha. were sown by airplane and another 1,000 ha. in 1941, at the rate of 1.3 kg. per ha. Checks on the ground made in the summer and fall of 1941 and 1942 disclosed that the first sowing produced on an average 19,367 seedlings per ha. and the second 26,855 seedlings. The latter included 14,650 pine (9,080 healthy, 1,820 doubtful and 3,750 dead) and 12,205 spruce seedlings (11,200 healthy, 575 doubtful and 430 dead). The total number of man-days required in airplane seeding (including staking out the area, preparation of the seed and the actual sowing) was 203 for every 1,000 ha. hand sowing 2,908 man-days, which on a per hectare basis gives 0.2 man-days by airplane, 2.9 man-days by hand. Airplane seeding appeared to give best results on freshly logged-

over land (1-3 years at most after logging). In this area the seeding should be done in late April or early May, preferably while snow is still on the ground.

• With large tree planting projects now in progress, the demand for planting material is enormous and this in turn calls for an uninterrupted abundant supply of high-quality seed. To provide such a flow of seed the Ministry of Forestry is carrying on every year a vigorous campaign of seed gathering all over the country — tree seeds and seeds of arborescent shrubs used in shelterbelt planting. In a number of forest regions selected forest areas, known as seed reserves, have been set aside and managed primarily for seed production.

Experiments are also being conducted on stimulating the seed-bearing capacity of individual trees. Most of the experiments on girdling, pruning of crowns and cutting of roots — some of which have continued for 10 years — have given apparently no positive results and some even proved negative in their effect. The only method that seems to hold real promise is systematic and repeated thinning of the stands to produce large uniform crowns exposed to full sunshine from all sides. Such thinnings must begin at an early age, at about 15 to 20 years. Experiments carried on since 1935 on the Siversk experimental forest in the Leningrad province, have yielded some interesting results. In all, 18 experimental plots were established, of which 14 were thinned and 4 left unthinned as control plots. Observations on seed production were made in 1937, 1938, 1939, and 1940. Interrupted during the war, they were resumed in 1946, and therefore cover a 10-year period. The stands were made up of Scots pine, 15 to 20 years old, on soil of fair to good fertility. In the first thinning from 200 to 600 trees were left per ha.; the control plots had about 1,000 trees per ha. Even after 3 years of thinning, a considerable difference in the length of the crowns in the thinned and unthinned stands became evident. The depth of the crowns in the thinned stands was 2 to 2.5 greater and their spread 3 to 4 times larger than in the unthinned stands. In 1946 the number of cones in the thinned stands amounted to 35,030, against 6,736 cones counted in the control plots. The number of trees bearing cones in the thinned stands amounted to 130 against only 32 in the control plots; the yield of cones in the thinned stands was 492 percent greater by weight and 520 percent greater by number than in the unthinned.

Logging and Engineering

United States of America

• In California, the perennial conflict between log haulers and state highway authorities reached a stalemate early this year — a "sitdown strike" of loaded trucks when the state tried to tighten the enforcement of load limits and the tolerance of overload allowed by administrative discretion. The logging industry has special problems in trying to adhere precisely to load limits, either total load or load per truck axle. Industry practice is to gauge loads by board foot content, whereas state authorities check loads by weight in pounds. Determination of log or load weight before loading in the woods is difficult, costly and not highly accurate, and is not always feasible or practical. The weight of different logs of the same gross dimensions can vary in a ratio of as much as two to one. Distribution of the weight on the truck, particularly of huge butt logs with pronounced basal swelling cannot be controlled to equalize weight per axle.

There is evidence that road damage is caused more by type of equipment, particularly size of tire and horse power, than by gross weight of the equipment and load. The effect of weight varies with the type of load; lightly surfaced roads are more subject to damage than more heavily surfaced roads with deeper sub-bases. The universal use of logging trucks on public highways means some compromise must be reached. Proposals include setting up maximum dimensions for butt logs, substitution of board foot measurement for weight, in pounds, setting up gross weight tolerances for trucks of certain specifications, provision of discretionary permits under specified conditions, and permission for haulers to offset overloads by financing the repair of any abnormal damage to roads.

Union of Soviet Socialist Republics

• How to make logs of broadleaved species more floatable has been studied for some time by several research institutes. The traditional method is to leave the logs, cut in winter or summer, to dry in the air for six months or longer. This has several disadvantages. First, the drying proceeds slowly and not uniformly; even after six months some logs still contain too much moisture to make them safe for floating. Second, through being left for a long time in the forest, many logs, especially birch, become infected with several forms of rot; barked logs develop cracks and the wood becomes discolored.

A proposed method of reducing the specific gravity of the logs to increase their floatability is through the use of the evaporating power of the leaf surface of the trees. It has been established experimentally that an average tree crown of 60 m² surface transpires into the air every 24 hours the following amounts of water: ash 8.0 kg., birch 9.0 kg., aspen 9.0, beech 5.5, maple (sharp-leaved) 4.0, spruce 4.0, pine 3.0, and fir 3.0 kg. If the water supply from the roots can be cut off while the leaves continue to give off water the moisture content of the wood can be greatly reduced within a short time. This process Russian foresters call biological drying in contrast to surface drying.

Weight Before and After Biological Drying

(kilograms per m³)

Species	Before drying, freshly cut	After drying for different lengths of time		
		5 days	10 days	15 days
Birch	950	860	780	750
Aspen	970	870	780	750
Spruce	850	730	660	630
Pine	860	820	790	770

During 1949-1952 tests were made on 4,000 m³ of sawlogs, mostly of broadleaf species, in one of the forest units in the Leningrad province regarding the effect of biological drying on the floatability of the logs. The tests were made both in the laboratory and under actual field conditions. In the case of conifers it is enough to cut through or girdle the sapwood to sever the water supply; with broadleaved trees the water-conducting vessels occur in both sap and heartwood and the center of the tree contains most moisture — girdling the tree therefore is not effective and the whole tree must be cut down.

The felled trees must lie on the ground with all their branches and foliage for about 8 to 10 days before they are cut up into log lengths. This period of biological drying is sufficient to lower the weight of 1 m³ by 150 to 200 kg. (see Table). These results relate to clear felling where care has been exercised to avoid trees falling one upon another. With selection felling it requires 30 to 45 days to obtain these results (and by air drying of logs - 230 days).

A number of birch logs 5 meters long and 16 to 28 cm. in diameter at the smaller end were followed through an entire log drive to check floatability. Biologically dried logs remained in the water without sinking for 50 days; after 3 months there was a sinkage of about 10 percent. Logs treated, in addition, on the ends with some waterproof substance remained in the water in excellent condition for 5-6 months, the sinkage for the entire period ranging only from 0.5 to 3 percent depending on the waterproofing substance used. It therefore seems that biological drying plus waterproof coating of the ends of the logs can preserve the floatability of broadleaved species for a long enough period (4 or more months) to complete their transport by water to their normal final delivery points.

Forest Injuries and Protection

Australia

• The State of Victoria has a total area of around 87,000 square miles (35,200 ha.) of which 7,800 square miles (3,100 ha.) are permanent forests and national parks and 14,200 square miles (5,700 ha.) are unreserved timbered Crown lands. The climate is characterized by long, dry summers, by hot winds of very high velocity and by very low relative humidities.

The first great fire disaster occurred in 1851 in the early days of settlement when almost the whole State was burned over and many lives were lost. Other great fires occurred in 1886, 1898, 1901, 1914 and 1919, after which a Forests Commission was formed. But great fires continued, culminating in the disaster of January 1939 when 71 lives were lost, 69 sawmills destroyed, over three million acres (1.2 million ha.) of valuable forests destroyed or seriously damaged, and two townships obliterated. Climatic conditions were extraordinarily severe, shade temperatures reaching 117°F (47°C), relative humidity falling to 4 percent, and wind velocity attaining 60 to 70 miles per hour (96-112 km. p.h.).

A Royal Commission was appointed to study and report on requirements to meet the fire problem. Most disastrous fires originated outside the major forest belts, being caused by burning operations to clear lands and from deliberate incendiarism. The forests themselves, composed almost wholly of eucalypts, become excessively dry, as do many of the pastures maintained for grazing. Even today, all of the dangerous fires are caused by man through intent or carelessness.

The fresh start taken after 1939 aimed at creating a fire-control system designed to meet the worst possible conditions; reducing fire numbers through publicity and educational programs; providing comprehensive and strict fire laws; creating adequate detection and communication systems; minimizing the time between detection and suppression action; creating a trained, properly dispersed, thoroughly equipped fire-fighting force; extending protection beyond the State forest boundaries; making the forest areas accessible to motor vehicles; and providing static water supplies wherever needed.

Progress during the past 13 years has been good, though there are still too many fires. Public behavior has been changed for the better. A very adequate and comprehensive law gives needed powers to the Forest Authority. There are 110 continuously manned lookout towers, and the Royal Australian Air Force provides supplementary patrol for detection. A system of fire weather forecasting is provided by the Commonwealth Meteorological Bureau. Radio and telephone communication has reached a high level of completion. A fleet of 200 trucks, together with a large stock of other equipment, particularly tank trucks, has been built up. There are 360 permanent officers and 1,500 short-term employees available during the fire season. Controlled strip burning is carried out along the borders of more valuable forests and within marginal areas of low value forests, slash burning is controlled, and hazards around sawmills, camps and forest townships are removed annually. Accessibility has been greatly increased through the construction of 8,000 miles (12,900 km.) of motor roads. Many water storage facilities have been installed. A country fire authority, charged with fire control on the farming and pastoral areas of the state, has been created, is well organized, and co-operates fully with the Forest Authority.

Canada

• Studies of decay in white pine (*Pinus strobus*) have been made in Ontario, according to the *Canadian Journal of Botany*, on sample areas where the trees were felled and cut up for analysis. About 52 percent of the more than 1,000 trees examined contained decay, with a clearly marked relationship between age and decay. Thus 40 percent of the trees in the 60-year-age class had decay, and 100 percent in the 220-year-age class, with loss in merchantable volume of respectively 4 and 40 percent. There was no consistent relationship between percentage of decay and diameter but, in comparing vigorous and non-vigorous trees, the percentage of volume lost was greater in the latter. The age of maximum net periodic increment, that is, the pathological rotation, was found to be from 160 to 170 years. Although 13 wood-destroying fungi were found, *Fomes pini* was responsible for 90 percent of all loss in living trees.

Forest Management

United Kingdom

• In the October 1951 and January 1952 issues of the *Quarterly Journal of Forestry*, two articles were published on forest fire insurance abroad and in Great Britain. From these it appeared that the advantages afforded by insurance elsewhere in Europe were not available to forest owners in the United Kingdom, which was due largely to the fact that companies did not look with much enthusiasm upon forest fire insurance — partly because owners were apt to select only adverse risks for insurance and partly because so little information was available regarding the incidence of fires in private woodlands over a period of years, and it was difficult to assess a suitable premium.

To overcome these difficulties, Lloyd's Underwriters have made a study of all the data available and have recently produced a standard forest fire insurance policy, which, it is hoped, will meet owners' requirements at rates which they will be prepared to pay. The policy applies only to woodlands dedicated to or approved by the State Forest Service, and incorporates two new ideas. The first is that when an owner decides to insure, he will be asked to cover all his woodlands under 25 years of age; the second, that he must take out his policy for a minimum of three years. These provisions have been designed to prevent the selection of only bad risks, and to enable Lloyd's to quote finer rates of premium. Special arrangements can be made to cover woodlands over 25 years old. The basis of valuation is the net replanting cost plus the value of the annual increment.

Annual rates vary from 2s. (28 cents) percent for hardwood plantations to 10s. ($1.40) percent for pines. The average rate for a well-wooded estate containing hardwoods, mixed woods, larch and other conifers, would probably work out at about 5s. (70 cents) percent over-all.

The question of forest fire insurance is worthy of the closest consideration by all owners, as in many cases large sums are locked up in private woodlands; at these rates of premium many will think that forest fire insurance is worthwhile.

United States of America

• A recent step in providing forest credit in the United States is the adoption of large woodland loan programs by three of the major insurance companies and active study of such an undertaking by two others. The conditions covering the loans are not fully set, but generally include provision for a sustained yield management, and protection from fire, insects and overgrazing. The lending agencies usually prefer loans of $25,000 or more, and interest rates are about 5 percent.

Industry and Trade

Canada

• While the demands of the fishing industry and the export trade in pitprops account for a considerable portion of the primary production from the forests of Newfoundland, the two pulp and paper companies are responsible for the greater part of the manufacture of forest products. Composed of many small units, the sawmill industry's output is not large, mainly because of the localized character of settlement and the quality of the raw materials, which are much more suitable for pulpwood than for sawlog production.

As in other parts of Canada, the pulp and paper industry in Newfoundland expanded rapidly since the first pulp mill was erected in 1907. Although early production statistics are not available, the industry's growth can be gauged by the rise in newsprint exports from 62,000 tons in 1931 to 315,000 tons in 1941. Wood-pulp production in 1949 reached a peak of about 400,000 tons. In that year, Newfoundland, with a record newsprint production of about 440,000 tons, ranked third among newsprint-producing countries of the world, being surpassed only by the rest of Canada and the United States.

In terms of employment and value of products, the pulp and paper industry ranks lower than the fishing industry. Over the past 10 years, the two pulp and paper companies have employed an annual average of over 3,000 men in forest operations and over 3,000 men in mill operations. The latter figure remains fairly constant throughout the year, while the number of men in woods operations varies considerably, showing a maximum in the autumn, when most of the cutting is done.

Besides materially altering the pattern of employment in Newfoundland, these companies through their development have made possible the establishment of a number of settled townsites in the interior of the island.

United States of America

• To help the establishment of new factories in underdeveloped areas on a world-wide basis a non-profit organization, whose income is derived from manufacturing, has been set up in the United States to sponsor the following services:

1. Investigate the needs of the various areas of the world for manufacturing plants to convert raw materials at the source.
2. Through research, determine efficient and practical machinery for small low-cost factories. Design standard factory layouts for manufacturing high-grade materials on a profitable basis.
3. Train and bring together specialists for the establishment and operation of these factories.
4. Arrange for the installation and demonstration in each major area of one standard small factory for each chosen resource, in co-operation with machinery manufacturers, sponsoring organizations and governments — this factory to serve as a demonstration unit and as a training school.
5. Arrange for the purchase and shipment of machinery and supplies for additional standard units when requested.
6. Aid in the establishment of each production unit as a going concern.
7. Help obtain financial participation in favorable situations, where it is requested.
8. Supply marketing aids for production which is in excess of domestic needs.

Union of Soviet Socialist Republics

• Strenuous efforts have been made over the last two decades to shift the centers of the timber industry from the west and central European provinces to the north, the Urals and the Far East. It was necessary to open up new regions by roads, to create large industrial enterprises capable of utilizing the timber, build settlements for workers, and to allocate to each enterprise a large enough forest area capable of supplying a definite annual cut for a long time.

Percentage of Total Annual Cut

Region	1948 actually cut	1953 expected cut	At end of 5 Year Plan
Northern European Russia	11.0	13.0	17.0
Karelia Republic	3.0	3.0	5.0
Urals	16.0	20.0	20.0
W. Siberia	7.0	9.0	9.0
E. Siberia	11.0	13.0	14.0
Far East	6.0	7.0	7.0
Total ...	54.0	65.0	72.0
Northwestern part of European Russia	3.5	3.0	3.0
Central provinces	23.0	21.0	17.0
Volga region	3.0	2.0	1.5
N. Caucasus and Crimea	6.0	2.0	1.5
Central Asia and Kazakstan	1.0	1.0	1.0
Transcaucasia	0.5	0.5	0.5
Southern parts of European Russia	6.0	2.5	1.5
Western parts of European Russia	8.0	3.0	2.0
Total ...	51.0	35.0	28.0

It is reported in *Lesnoye Khoziastvo* that, by the beginning of 1953, some 1,720 large timber-producing enterprises had received definite allocations of exploitable timber reserves with a total possible annual cut of 300 million m^3 over a period of 21 years. There are still many difficulties to overcome before the planned shift can be completed.

By the end of the present 5-year plan, it is expected that more than $^{7}/_{10}$ of the total annual cut will be centered in the north of European Russia, the Urals, western and eastern Siberia, and in the Far East. The progress expected is shown in the above Table.

Forest Products and their Utilization

United Kingdom

• Recent laboratory studies on fire endurance of timber beams and floors, made as part of the National Building Studies in the United Kingdom, have resulted in methods for calculating the fire endurance of most typical timbers of floor-ceiling constructions. The steps involved are:

a) to estimate the breaking load of the joist;

b) to express the applied load of the joist as a fraction of the breaking load;

c) to read off the fire endurance from curves developed by the studies which show the time up to collapse in minutes against the ratio of applied breaking load for beams of different sizes;

d) to add to the endurance indicated the period of protection expected from the ceiling as worked out during the studies.

United States of America

• As experience has been gained with the production of yeast from waste sulphite liquor, so interest in its usage has expanded into the field of pharmacy and the realm of foods for human consumption. In order to supply the expanding market, a new yeast plant is now under construction at a pulp mill in Green Bay, Wisconsin, where a production of some 4,500 tons of yeast per year is planned, starting in 1954. It is of interest to note that the first yeast plant at Rhinelander, Wisconsin, designed to produce 1,200 tons of dry yeast annually, has since been expanded to manufacture about 2,000 tons per year, and further facilities for increased production are being installed.

Uses for the supplemental values in this yeast were first developed in the poultry field, but additional markets are developing in the feeding of pigs, dairy calves and cows, fish in hatcheries, dogs and other pets, as well as in foods for fur-bearing animals, particularly mink. The production, however, of speciality products which may be of far-reaching value in the field of food as a whole still requires much expensive research for adequate development.

• The Forest Products Laboratory at Madison, Wisconsin, is currently doing much special research for various defense agencies. A major activity deals with shipping containers. Projects are under way covering cushioning materials, packaging of grease-coated parts, crates for aircraft parts, fiber drums for aircraft components, packaging of training planes to be shipped by padded van or by air, blocking and bracing

of jet engines on railroad cars, and preparation of a manual for air cargo shipment. A potential saving of about $45 million in air transport cost is within reach as a result of the research done to date. Other research under way is the evaluation and development of new structural plastics, adhesives and sandwich constructions; plastics and metal sandwich construction which must operate at temperatures far above those at which wood burns; the performance of wood at 70°F (21°C) below zero; and use of wood for transporting liquid gas to be subjected to temperatures nearly 300°F (112°C) below zero.

Forest Policy

Australia

• There is no national forest policy for Australia as a whole. The several state governments each control independently the forests within their boundaries, and each state has its own forest policy and forest legislation. The Commonwealth Government has established a Forestry and Timber Bureau, which ensures sound management of such forest areas as are under Commonwealth control, and performs certain functions of a national character in the forestry field, such as education and research. The bureau also acts as a central medium in achieving a measure of co-operation between the various Australian forest services.

The planning and construction of roads to virgin native forests has resulted in a general increase in timber production of at least 2 percent over the rate of population increase during the last two years. The financial stringency which resulted in the curtailment of loan funds for the financial year 1952-53 will have reduced the amount of road construction possible in that period, and this must consequently reduce to some extent the rate of increase in timber production. However, the same financial stringency has also caused a diminution of demand for timber within Australia, and resulted in a considerable increase in exports overseas.

There is a definite shortage of Australian grown softwood, and all forest departments have planned increased rates of establishment of softwood forest, in some cases, even at the expense of the regeneration and protection from fire of the native hardwood forest.

Belgian Congo

• The forest policy adopted with the coming into force of the decree of 11 April 1949 continues to be implemented. It involves:

a) inventory of state forests and assessment of the proportion of natural forest in the total wooded area of the country;

b) reservation of forests to be maintained for climatic, economic or other reasons (erosion control), and study of management methods for these reserved forests;

c) regulation of logging on the basis of the allowable cut for the existing forests;

d) improvement of cut-over forests by introduction of species valuable as exports through planting with cash crops or by broadcast sowing, clump or strip planting;

e) protection of the savannas and control of brush fires so as to promote the restocking of suitable savanna lands with forest species; combining forest fallow with crops where at present only fallow under grass is possible (hardwood belts being used to compartment the savannas);

f) establishment of stands to meet specific needs of the population, industry or transport.

The Governor-General's Ordinance of 25 May 1953 for the protection of the savannas and the control of brush fires is a decided improvement on previous legislation in that it prohibits late burning but encourages early burning which has very little effect on the tree or shrub life of the savannas and destroys less organic matter than late burning.

So far as specific timber needs are concerned, in certain centers and for certain forms of transport (shipping and railroads) there is a problem of fuelwood supplies. A production program has been drawn up under which stands of fast-growing species are established to yield good quality fuelwood at an early age. Volume yields of some exotic species, particularly eucalyptus, in the mountains of the eastern Congo have exceeded those obtained over the same period of time in their country of origin. In Ruanda-Urundi, less fertile land unsuited to pasture and farm crops has been compulsorily reforested with a view to satisfying the domestic needs of the people.

Canada

• The Canadian report to FAO for 1952-1953 states that, under authority of the Canada Forestry Act of 1949, the Federal Government, between 4 December 1951 and 12 June 1952 entered into agreements with the governments of eight of the ten provinces of Canada. These agreements provide for federal financial assistance to the provinces in completing inventories of their forest resources within the ensuing five years, and in the reforestation of unoccupied Crown lands during the same period.

The classes of forest inventory surveys covered by these agreements are, broadly speaking, those defined as reconnaissance and national forest surveys in FAO's publication, *Planning a National Forest Inventory*.[1] They are designed to determine the extent and location of forested areas; to classify productive forest as to type and size of forest growth and as to ownership or tenure in the accessible regions; and to provide estimates, by species, of accessible timber volumes for large areas such as provincial administrative districts, together with some information regarding annual growth. The Federal Government undertakes to pay one half the cost to the provinces of carrying out such surveys, including the preparation of forest map and inventory reports, the programs and performance of the work being subject to federal approval. The more detailed working plan type of survey is not eligible for federal aid under the agreements.

Except in the case of Prince Edward Island, where forest conditions differ materially from the other provinces, the federal-provincial agreements respecting reforestation provide for payment by the Federal Government of one-fifth of the expenditure made by the province in each fiscal year for the reforestation of its unoccupied Crown lands under approved programs, or the amount by which such expenditure exceeds the average cost borne by the province itself for that purpose during the three years immediately preceding, whichever is less. An incentive is thus provided for the expansion of reforestation programs on denuded provincial lands which are not under lease or license. In order to simplify accounting and auditing procedures most of the agreements were amended in 1952 to provide for federal payments, substantially equivalent to the above, on a flat-rate basis according to the number of trees planted or acres seeded rather than as a percentage of cost. In addition, the Federal Government undertakes to pay one-fifth of the cost to the provinces of establishing and operating new forest nurseries, that is, nurseries not yet in actual production.

The Forest Research Division of the Federal Forestry Branch recently adopted a new statement of forest research policy and undertook the preparation of plans to govern work in the near future in the various field districts. These plans, while providing for research activities likely to be of the greatest usefulness in individual districts, will so far as possible be co-ordinated in such a way as to ensure a reasonable distribution of research activities among the major problems which are common to forestry in all parts of the country.

Similarly, a new statement of research policy was adopted by the Forest Products Laboratories Division to govern the work in the laboratories located in Ottawa and Vancouver. Programs of research spon-

[1] *FAO Forestry and Forest Products Study, No. 1.*

sored by the Federal Government and the pulp-using industries, aimed at increased use of hardwoods for the manufacture of wood pulp, have also been actively pursued.

Ceylon

• An act concerning soil conservation was approved by the Ceylon Parliament on 13 August 1951, but there may be delay before it becomes effective. Ultimately, it will empower the Minister of Agriculture to:

1. declare any area an "erodable area" and enforce special protective measures against erosion on all land within its confines;
2. apply general regulations to certain types of cultivation or soil utilization, for example, prohibit or restrict the burning of grassland, and impose penalties for allowing fire to spread during the burning of "chenas" or shifting cultivation.

It is hoped that penal measures will not have to be inflicted and that demonstrations and training given to land users, as planned under the act, will be sufficient for its enforcement. The present staff of the Ministry of Agriculture is inadequate to carry out the proposed program, for which the eventual requirements are estimated at 20 officers and 450 field demonstrators. A special three-month course in soil conservation work is planned to provide a nucleus of temporary staff.

Greece

• Reforestation mainly with conifers is carried out both for economic reasons and soil conservation purposes, the latter especially on torrent watersheds. A serious effort is being made to establish fast-growing species such as poplars and eucalyptus.

It is not expected that new stands will yield more than 1 m^3 per ha. annually during the early years, and when fully developed their capacity is not likely to exceed 1.5 m^3 per ha.

A government report states that there are now in operation 12 sectors of projects concerned with torrent restoration, individual works being carried out on 58 torrents. During the fiscal year 1952-53 three billion drachmae were made available for the construction of engineering works in these watersheds. In the torrent basins under restoration, a change in the type of the farmers' economy through the restriction on goat breeding is assisted by the development of forestry.

A special effort is being made to improve mountainous grazing land which covers 50 percent of the land area, approximately 6 million hectares. Two grazing districts are being organized on the mountains of Olympus and Tzumerka. Improvement projects are carried out in these districts, for instance watering facilities for animals, construction of reservoirs, roads and trails. Water collection projects are also in hand, together with fencing, artificial seeding, re-seeding, establishment of experimental plots and demonstration plots for imported forage plant varieties.

India

• The research institute at Dehra Dun has recently set up a soil conservation branch with centers in the different states for research and demonstration purposes. It is affiliated to the Central Organization for Soil Conservation of India, which operates under the direction of a Soil Conservation Board composed of the Minister of Agriculture as chairman, the Director of Soil Conservation as secretary, the Inspector-General of Forests, the Agricultural Commissioner, a member of the Central Water and Power Commission and a representative of the Society for Soil Conservation. The principal functions of this are to promote, organize and co-ordinate research on the conservation of soil under various types of land use — agriculture, forestry, grazing, etc. — and to give technical, administrative and financial assistance to the different states and river valley projects. It is setting up a technical staff, both at senior and junior levels, to take care of soil conservation projects. A desert research center, recently formed at Jodhpur, will also come under the direction of the Board.

Netherlands

• A new forestry bill has been prepared to replace the existing act, which dates from 1922, and some emergency acts of shortly before and after the war. This bill has been published but not yet introduced into Parliament. Detailed regulations will be left to a forestry board, which will probably be established in 1953, to be composed of representatives of various organizations or interested parties (labor organizations, associations of forest owners, the State Forest Service). All forest owners are statutorily bound to observe the regulations made by this board.

The State Forest Service, which has been in existence for more than 50 years, is concerned not only with the state forests, which comprise approximately 15 percent of the total forest area, but also with many forests owned by municipalities and general associations. It is also responsible for the administration of all statutory regulations and the dissemination of information but not for forestry research.

Forestry research is carried out by the Forestry Experiment Station and the Institute for Forestry Research, both at Wageningen, and the Institute for Applied Biological Field Research at Oosterbeek. The latter is mainly responsible for research on and control of insect damage.

New Guinea

• A revision of the existing forest legislation in Netherlands New Guinea is under consideration. For a full development of forest utilization it is necessary that the forests should be freed from user rights; this is also specially desirable in the case of forests reserved for watershed protection roles, and efforts are being made to bring about a satisfactory state of affairs.

For the first time for many years Molucca ironwood is being exported again in 1953. The wood is purchased by the forest administration, and also by private concerns and some local people. Timber felling is mainly the concern of co-operatives, which either sell the timber themselves or supply it to the forest administration.

Puerto Rico

• According to Puerto Rico's report to FAO for 1953, the objectives for forestry in the island have been clarified by restatement as a section of the country's agricultural development program. The goal is the raising of forest productivity of some 600,000 forest-type acres (242,820 ha.), about ¼ of the land surface of the island, to a point where each acre will in the long run contribute its potential of forest products, soil conservation, and water-flow regulation for the benefit of the most people. This program, led by the forest services of both the United States and the island, aims to intensify educational efforts to ensure improvement and development of privately-owned forest land and, where progress is economically unattainable, to incorporate such lands under government ownership by voluntary donation, exchange or purchase.

Surinam

• The aerial survey made in 1947 of the northern half of the country has revealed that 75 percent of that part of the country is covered with tropical forests. Present timber production of Surinam amounts to 130,000 cubic meters of roundlogs per year, which is far below the potential output. The timber crop per hectare is low on account of poor knowledge of the timber stand and antiquated logging and transport methods, and consequently exhaustive felling has taken place along the accessible rivers. The current forest project aims at locating economically exploitable timber stands over an area of 500,000 hectares and a minimum production of 50 cubic meters per hectare. With a felling cycle of 80 years and a yearly felling on 6,000 hectares a yield can be obtained of 300,000 cubic meters. The project has four distinct phases:

Inventory – a ground survey based on aerial mapping.

Research – of the 200 usable species only 50 are sufficiently known. Ecological studies will be necessary in

order to obtain data on regeneration prospects. Technical and economic possibilities as to types and species and their processing will be examined.

Exploitation – opening up of forest areas and laying out the principal communication roads, etc.

Extension – education and publicity on exploitation methods, processing and handling of timber, and marketing.

The estimated total costs, inclusive of an amount of 800,000 guilders for an investigation into the possibilities of large-scale planting of pulp and plywood species, amount to Sur. florins 6 million. In comparison with production in 1950 valued at about Sur. fl. 4 million, the increased production is expected to amount to Sur. fl. 13 million, with exports valued at Sur. fl. 11 million.

United States of America

• Two systems for obtaining a comprehensive and integrated management of major river basins are now under test. The first, exemplified by the well-known Tennessee Valley Authority (TVA), is based on a central federal authority. The other, for example the Missouri River Basin, is based on an inter-agency committee including the six major federal departments concerned in comprehensive plans, together with governors of the ten basin states, the theory being that, through exchange of information and plans, and through discussion of these, an effective co-ordination will be worked out.

The Missouri Basin comprises 529,000 square miles (137 million ha.) or 17.5 percent of the total area of the continental United States. About 2 percent of the State of Minnesota is in the Basin, whereas 100 percent of Nebraska and 97 percent of South Dakota are in the Basin, and other states lie in between these proportions.

Since 1945, when the committee was organized, study and planning has been continuously under way and, with the current fifth revision of the plans, the total estimated cost for the Basin has reached the figure of nearly 11¼ billion dollars, an increase of nearly 1.9 billion dollars over the previous estimate, due to increases in unit prices and to supplementary features added as a result of recent unprecedented floods in the Basin. Current estimates involve an average of over $ 33 per acre ($ 82 per ha.) for the entire Basin area. Of the total, about 67 percent is calculated for major engineering projects, chiefly on main streams, and the remainder for all other measures. In particular, projects planned by the U.S. Department of Agriculture involve those for conservation and improvement of grass and crop land and for forest and forest range lands, together with measures for stabilizing small water courses.

That the comprehensive program planned at present is of a long-term nature is indicated by the fact that detailed estimates contemplate expenditure of no more than 27 percent of the total program during the next six years. The program is already under way on an individual project basis as projects have been given legislative approval. To-date, about 11 percent of the total estimated program has been installed or is in the process of construction.

Selected Reviews

Conservation in Canada. O.M. McConkey. 1952. pp. 215. J.M. Dent & Sons (Canada) Limited, Ottawa. $ 3.50.

One result expected from recent technical assistance programs of international organizations and single nations was that professionals, after a period spent in dealing with problems in varied parts of the world, would return to their own countries with a keener, more vivid and realistic grasp of world lessons applicable to their homelands. Another hope was that the teams of technicians from many nations and races would open the eyes of specialists to the fact that conservation is one indivisible whole, not a mere aggregation of many distinct units having some general similarities each to the other.

This compact little book indicates that technical assistance programs may indeed develop in such a way that the nations which render assistance receive as well as give. Certainly the author, a professor of field husbandry, sees the Canadian scene as a whole, and criticises unsound trends in land use in his own country in the light of such final results of lack of conservation which he has seen in China and elsewhere in the course of foreign aid tours.

Yet this is much more than an appeal to fear, although the application of this point to the Canadian problem is not forgotten. Full emphasis is given to techniques already proved to be sound for productive and permanent use of land and water — more forestry and better utilization of wood, more grassland agriculture, more conservative grazing and the rest. The main techniques—windbreaks, crop rotations, contour cultivation and the like — are illustrated in terms of Canadian policy.

The general reader, and particularly the citizens who make public opinion in Canada, have here a readable, sound and convincing basis for an over-all program to carry out the author's deep belief that conservation, using available methods, must replace extractive use; a unified national plan must supersede unco-ordinated programs; Canada, a rapidly developing country, must recognize that great opportunity still exists, for so much of its wealth of resources is yet undamaged. And the same opportunities and obligations exist in many other countries whose natural resources have still to be fully developed.

Management and Conservation of Vegetation in Africa. A Symposium. Bulletin No. 41 of the Commonwealth Bureau of Pastures and Field Crops. 1951. pp. 96. Illus. Commonwealth Agricultural Bureaux, Farnham Royal, Buckinghamshire, England. 10/6d.

This is an unusually good description of the major vegetation types or ecological zones in African countries of the Commonwealth and of what is happening to them now that, through control of human and animal diseases, the native populations and their domestic herds have greatly increased. In brief, this has put great pressure on the land, and degradation of forest, savanna and veld areas has proceeded rapidly.

Shifting cultivation accompanied by burning has destroyed or greatly reduced the productive capacity of vast expanses of once valuable forest, while on steep mountain slopes there has been a senseless wastage of soil. As the need for land has increased, more and more forest has been cut, the debris burned, a crop, or occasionally two or three, taken and the field then abandoned. Where periodic burning does not occur, the forest can re-establish itself and if the fallow period is long enough and the slope not too steep, the soil may be rebuilt sufficiently in seven to nine years for the process to be repeated and another successful agricultural crop taken. In too many places periodic burning has caused a grave diminution in fertility, especially where coarse grasses have encroached on the abandoned fields and there has been a shortening of the forest fallow period because of the demand for land. Extension of poor agricultural practices into semi-arid and arid areas has become a serious factor in soil erosion.

In general, only a start has been made in reserving those areas that will be required to produce the necessary wood products and to con-

serve water supplies. In Tanganyika, a few large grazing reserves have been established. In South Africa, through studies at a number of experimental stations in representative areas, sound principles for land use, grazing management and veld burning have been developed. Of major importance in grazing management is provision of a rest period during the growing season of the grasses. These rest periods vary from one type to another. It is important that there should be appropriate intensities and seasons of grazing and of other phases of systems of management to meet the special requirements of each vegetation type.

Burning in spring after rains have fallen about every two years has a place on sour veld (areas where grass becomes unpalatable after maturity). At other times and in sweet veld (areas where grass remains palatable after maturity) burning is damaging. Burning can also be used every two years, after rains in the spring, to aid in control of thick cover of thorn scrub. Dense stands of such scrub (acacia) are useless from a grazing and water conservation standpoint.

PLANNED MANAGEMENT OF FORESTS. N. V. Brasnett. 1953. pp. 238. George Allen and Unwin Ltd. London. £1.

FOREST MANAGEMENT. H. Arthur Meyer, Arthur B. Recknagel and Donald D. Stevenson. 1952. pp. 290. The Ronald Press Co. New York. U.S.$ 6.00

FOREST POLICY. William B. Greeley. 1953. pp. 278. McGraw-Hill Book Co. New York, Toronto London. U.S.$ 5.50.

Two books on forest management have recently appeared, both remarkably well presented and arranged and the fruit of their authors' long experience. While they deal with the same subject, they differ to such an extent as to justify comparative study.

The first by N.V. Brasnett, Lecturer in Forest Management at the Imperial Forestry Institute, Oxford, is written in the classic manner. Part I contains a short but lucid account of all that should be known about forest stands — how they increase in value, the considerations on which management of a forest should be based, and the possible goals of management. The writer then takes, one by one, the various parts of an ideally arranged management plan and shows how they should be operated. Part III is a historical account of management methods in western Europe, which throws light on the systems explained in Part II and gives the reasons why they have come to be more or less satisfactorily developed.

Forest Management takes another line of approach. It is the work of three American foresters holding very different posts — one is Professor of Forestry at the Pennsylvania State College, another Technical Director of Forestry with the St. Regis Paper Co., and the third Research Adviser in Forestry to the Office of Foreign Agricultural Relations, U.S. Department of Agriculture. Their aim is explained in the preface:

> "The present textbook is a definite departure from the classical European approach. The authors have attempted to bring together in a single volume the basic material on forest management, from the standpoint of its applicability to American forest practices. The chapters in parts I and II are devoted to the general problems of forest organization. Thus, in the traditional way, these problems have been segregated from the specific problems discussed in part III, which is concerned with the principles and methods of forest regulation, that is, the principles and methods used in determining the allowable cut. Rigid methods of forest regulation and elaborate formulas for the determination of the allowable cut are considered a thing of the past. The fourth and last part of the book is devoted to management plans. Typical examples of management plans for forests of various sizes, located in various parts of the country, have been included in only slightly abbreviated form ..."

Thus the second book deliberately reverses the approach used in the first. What must we think of it? Is it true that rigid methods of forest regulation and elaborate formulas for the determination of allowable cut have become useless?

By rigid methods presumably must be understood methods of regulation by area. But Mr. Brasnett tells us that the more rigid of them, for instance the 'méthode du tire et aire', are still in use over large tracts of forests in certain territories under British administration and that, given a certain amount of flexibility, they prove very useful and introduce at least a minimum of order where otherwise there would be chaos — but it must be admitted that the key qualification is flexibility. Nevertheless, the principles of the methods remain sound. Area methods are indeed even more widely used than would appear from Mr. Brasnett's book; he classifies as mixed area and volume methods, for instance, permanent periodic block and revocable periodic block methods where the volumes, incidentally estimated for only a small part of the forest, are really only a guide to the application of management regulations. Likewise, the control method, as those who advocate it strongly claim, is essentially an area method.

It may also be said that the old formulas for the determination of allowable cut by volume are not in fact over-elaborate but rather quite simple and precise. Theoretically they may be, and often in fact are, useful for forests about which very little is yet known.

However, we must agree with the authors of *Forest Management* that modern methods of inventory and forest mensuration that can be applied even to very large forests help considerably to curtail the empirical period and to break through the chaos to which Mr. Brasnett refers. They also make it quite possible to estimate the volume which can be cut annually or periodically in a particular forest on a sustained yield basis. The distribution of the cuts in time and space for the production of the necessary volume may be governed solely by silvicultural and economic considerations.

These calculations or estimates are based on three factors, the second and third of which are closely connected the standing volume and present increment of the particular forest, which modern techniques can determine precisely or at least with a known degree of precision; consideration of the normal forest; and the goal which the forest owner is seeking to attain and the speed with which he desires to attain it.

These are the three factors that *Forest Management* deals with at some length. Consideration of the normal forest takes up quite a sizeable portion of the book, and rightly so, the writers dealing first with normal even-aged forest and then with normal uneven-aged forest.

The relationship between the third factor and the second is also very important. Once a forest owner has decided to manage his forest, that is to say, to bring it under sustained-yield regulations — and the authors of *Forest Management* here make a useful distinction between management and exploitation — the policy he proposes to adopt will actually depend on his conception of the normal forest that is sooner or later to replace the growing stock now occupying the forested area.

In the case of even-aged forest, determination of rotation will be the essential factor in this conception, and the work of the three American authors clearly shows how rotation affects yield and gross yield as well as the annual forest rent per acre obtained in the forest. The chapter on uneven-aged forest clearly evaluates what is known of the composition and growth of normal uneven-aged high forests, but unfortunately does not indicate how far the owner of such a forest can influence the quality and quantity of the products it yields. The theory of rotation is, in fact, not apposite to uneven-aged forest and should normally be replaced by that of maximum diameter up to which trees are desired to grow.

As the writers point out, much research has yet to be done on the normal composition of uneven-aged forest. Studies on virgin forests, as the section devoted to this subject shows, would be very useful for the advancement of knowledge, but they are unfortunately few in number and it must be admitted that, if excellent results have been obtained from the systematic management of certain

uneven-aged forests, this management has so far been entirely empirical, in the sense that the ideal has not yet been defined.

After the brilliant work in the first three parts of *Forest Management*, a reader may confess himself somewhat disappointed with the last part on working plans. No doubt these plans illustrate a profound knowledge of the physical and economic conditions of the forest to which they are applied. Doubtless, also, it would be too much to expect to find precise directives, as would be possible in the case of forests subjected to working plans that have been revised again and again. Yet one is struck by the fact that practically the only concern of the writers seems to be to improve the forest. Concern with improvement is perfectly justified, but forest improvement is not in itself enough to guarantee sustained yield; normal distribution of age and diameter classes is also required — that is to say, the objective must be normalization of the forest. It is not easy to discern what action has been taken under these plans to achieve this end, and it is even difficult to deduce whether the aim is to establish even-aged or uneven-aged forests.

One of the plans given, that for the forest belonging to the Hassel and Hughes Timber Co., Wayne County, Tennessee, is of interest from another standpoint. This relates to a forest of 49,000 acres (19,600 hectares) recently purchased by a company that wants to get all its wood supplies from it. It has been badly depleted by previous fellings and can be improved and brought again under sustained-yield management only at the cost of substantial savings on increment. Such economies imply a definite drop in the quantity and, above all, a substantial decline in quality of the mill's supplies. Instead of being discouraged by this prospect, the Company has completely transformed its internal organization so as temporarily to rely on only a small amount of poor quality wood, without any cut in employment. This is a remarkable example of integration of the forest with the wood-using industry, a real achievement of sound forest policy in the true sense of the term. Admittedly, it is forest policy at the forest level. But, is not forest management essentially the local application of forest policy, and is not the main instrument of national forest policy the policy applied to each individual forest?

For this reason it seems advisable to review along with these two books a third of equal interest entitled *Forest Policy* and written by the Vice-President of the U.S. West Coast Lumbermen's Association.

Although its first brief section is devoted to the origins and methods of forest policy, the book is essentially a history of national forest policies. The second part, in effect, describes the development of policy in various countries selected from among the most representative, with particular emphasis on the more recent phases of development. Well documented, this section of the book is of considerable interest; an effort is made, generally with success, to bring out the characteristics of the forest policy of each country.

Of still greater interest is the third and more important part of the book, which gives an account of the progress made in United States forestry and, in its last chapter, deals with that country's current problems. This progress has many striking features, and Mr. Greeley rightly makes first mention of the development of education, not only among forestry technicians but also among the citizens of the country; in under 60 years, they have become conscious of the national importance of the forest, as a result of methods employed by the Federal Government and by the States, the universities and many large associations including the wood industries. This close co-operation, which is apparent in many other sectors of the forest policy, and in particular in the control of fire — the chief enemy at the beginning of the century of the American forest — is one of the best and most rapidly developed features of American forest policy. Outstanding progress has also been made in forest research, with the result that the United States is now one of the most advanced countries in this field.

But the most interesting thing about this policy — and this brings us back again to the pages of *Forest Management* — is perhaps the development of large forest-owning industries and the integration sought between the industries themselves and the forests that feed them.

However, the same thought passes through one's mind on closing *Forest Policy* as on reading the last part of *Forest Management*. Technical progress in the United States in the field of forestry is considerable; the knowledge of how to apply sound forest policy methods is steadily growing and their complexities are being ever better analyzed. Nonetheless, felling practices can still only be regarded as good or very good on 23 percent of the whole of what is called commercial forest and on 8 percent of private commercial forest, representing three-quarters of the total forest area. Cutting methods are bad or destructive on 72 percent of small private woodlands (under 5,000 acres 2,000 hectares), which in turn represent three-quarters of the privately-owned forest area. Even in the case of larger private forests, only 28 percent is under sustained yield management.

These statistics, it is true, are for 1945-46, and substantial progress is known to have been made since then. But progress in this particular field takes time. Despite the efforts made, the learning displayed and the results obtained to date in the United States, there still seem to be many undiagnosed difficulties yet to be overcome before the extensive program can be achieved which has been mapped out by the heads of the U.S. Forest Service for ensuring the increasing timber supplies required for the country's future development.

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[1] Gen. = *General*
Sc. = *Fundamental Science*
Silv. = *Silviculture*
Log. = *Logging and Engineering*
Prot. = *Forest Injuries and Protection*
Mens. = *Mensuration and Surveying*
For. Mgt. = *Forest Management*
Ind. = *Industry and Trade*
Util. = *Forest Products and their Utilization*
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culled forests, and western stations emphasize ridding deteriorated ranges of undesired plants. There has been much ingenuity shown, too, in developing methods and appliances to measure the behavior and disposition of water under many complexes of soil, rainfall, vegetation and land treatment. One western station is involved in a co-operative study of cloud-seeding as a means of reducing lightning fires. The work in forest genetics at the California station and elsewhere shows full awareness of methods and ingenuity in adapting them to particular groups of forest trees.

These hallmarks of station research — ingenuity of method and awareness of the world of science — reflect the association of the stations with universities, an affiliation planned from the start, and one which has clearly been productive.

Development of co-operative relations with other agencies and individuals continues, both in division of the field and in setting up joint projects. The end is not in sight, for there are clearly unresolved questions of agency jurisdiction and professional jealousy. But, generally, a large amount of genuine co-operative work exists.

PRODUCTIVITY of individual researchers — that is, volume, promptness and quality of professional publication — inevitably varies greatly. By their nature many projects are slow to yield definitive results, and many workers are reluctant to accept the labor of reporting, seeking always the one more year of gathering data. Legitimate delays occur, for example, because of transfers and through many current assignments to national defense projects. None of this is peculiar only to the U.S. Forest Service stations.

Clearly, the directors struggle manfully and generally to good effect with this widespread problem of research organization. There is little swindling of those who pay the bills. The annual reports are clearly in themselves a stimulus to keep analysis of data reasonably up-to-date and to produce progress reports. A multitude of media for publication has been developed and provides an incentive to authorship. There is small reason for roses to blush unseen.

It seems true that, with notable exceptions, appointment to the job of director, and to a lesser degree that of division chief, reduces greatly or eliminates the output of these selected men in the fields wherein they built reputations. It is perhaps asking too much to say that directors of research can be most effective when they can themselves practise their vocation.

At all stations, there is emphasis on making results known in such form and with such clarity that they will be understandable to potential lay users of research. Many devices are used — annual reports, articles for trade journals, speeches before user organizations, station leaflets, distribution of station publications to carefully prepared lists of persons, demonstrations on experimental areas, etc. Potential customers must be very obscure indeed to be overlooked. Delight in popular science writing and in extension is by no means a universal component of researchers, but insistence on such activity clearly maintains awareness of a real world and real, if technically ignorant, people, and prevents withdrawal into ivory towers.

So far, there has been exceedingly little evidence of sanctioned and unprofitable hobby-riding; that is, the pursuit of the last jot and tittle of data on projects of trivial worth, the sort of thing that makes appropriating bodies angry and mistrustful of whole programs. The relative youth of both programs and workers, the opening up of new and exciting vistas, the life and ferment in the program as a whole and in its parts, alertness of the direction, annual and often detailed review by hard-headed administrators and legislators, constant contact with the real world and its unsolved problems and with other scientific men have combined to offset the gravitational pull toward inconsequent senescence of effort. The wholesome retirement system has clearly helped.

ONE very great asset in building a worthy system and staff is the freedom of researchers to select projects of a highly controversial nature and to report results that bruise tender feet. Protective burning in southern pine forests, clearing of brush-covered land by fire in California, the effects of overgrazing both on forage production and on soil and water values in the Rocky Mountain and Great Basin areas, the true results of dollar silviculture in many regions, the self-defeating consequences of valuing public watersheds as though they were private utilities — these are examples of controversial questions faced in the programs.

Reporting of unpalatable facts is frank and impartial. A notable example is the devastating body of data obtained by several western stations showing the accumulated and continuing ill-effects of overgrazing on watershed and water values, the total effect being to pose the question whether, on some areas, any range use can be maintained if other far superior values are to be obtained. Administrators of public lands and owners and users of private lands no doubt can see a day of decision approaching. In this way stations are carrying out their unchallenged role as an official conscience.

SYSTEM, direction and the workers have blended to produce many combined operations. Some of the more impressive revolve around water and watershed protection and management. Several eastern and western stations have long-term studies of timber utilization and water relations–types of stands and of silviculture which will yield greatest flows of usable water and best protect forest soils and downstream values. Other stations in the west are, as noted, studying the range lands with similar aims. The newish field of woodland grazing and forestry in the south is getting wholesome and effective attention. Such examples illustrate the wisdom of the avowed intent that each station provide a rounded out service for all wildland values severally and collectively. From year to year, programs move toward greater attention to the many problems of interrelations.

In effect, there is no sanctified perfection in the system or its works. Users of results will continue to be impatient over apparent delays and gaps in programs. There may be chances to reduce work on projects which involve a heavy administrative load. But there is no sign that qualities of imagination, daring and intellectual ferment are diminishing, and there is evidence that politically effective support will continue to maintain the system's critical and worthwhile role.

S. B. SHOW

U. S. Forest Service (retired), and lately of the Forestry Division, FAO

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Forestry Abstracts Coverage List

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Grazing and Forest Economy

1953, 199 pp. (EFS) $ 2.00 10s.

This study is the combined work of the Forest Policy Branch of the Forestry Division, and deals with the problems as they affect temperate, tropical and arid regions.

Elements of Forest Fire Control

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